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Curriculum Guideline

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*1. Transportation
Grouping*

Module 1, 1986

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Introduction to the Transportation Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, Part B, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. Part A provides essential background for the planning of all courses in technological studies. The following three sections in Part A are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of Part B are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in Part B is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the transportation grouping. The grouping includes five subjects: automotive mechanics, auto body repair, small engines, service station attendant, and agricultural equipment servicing.

Students may enrol in courses derived from this document for a variety of reasons. For most students, the courses will be their initial introduction to the occupational areas within the transportation grouping. For some, enrolment will be the first step towards an apprenticeship as an automotive mechanic. For others, it will be an introduction to other occupations related to the transportation services, such as service station attendant or agricultural equipment mechanic. For many, it will lead to postsecondary studies. While each of the five subjects outlined in this document deals with unique content, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses in any of these five subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic, general, and/or advanced level courses. Each section includes aims and

suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific learning objectives, which shall be based on the aims for courses at the basic, general, and advanced levels. The nature of the core aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of the students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the core aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Transportation Grouping", at the end of this module, or from the course content listed at the end of any other module in Part B.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each

subject in the transportation grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Transportation Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 1.1.8 provides a summary of the core content for all courses in the transportation grouping. This summary chart is intended to provide a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Transportation Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the electronics section in the electrical component may be incorporated into the automotive mechanics program if appropriate to a particular theme or project.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in transportation, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with

each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 automotive mechanics, general and advanced levels) or at different grade levels (e.g., small engines, Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students acquire these skills, they are motivated to acquire related knowledge and develop desirable attitudes and understanding. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is removing a minor dent from a particular auto body panel or performing a particular automotive service procedure. Significant aspects of the completed product or service are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in transportation courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's progress on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions relating to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained through these experiences is particularly important to young people, who can expect to face a working life characterized by changing technology and the need to continually update their skill and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should also have opportunities to become aware of the various tasks that computer technology performs in the automotive industry. Visits to automotive servicing operations and training centres can show students how computer technology is used to access, record, and process information such as customer records, parts inventory, diagnostic data, and schedules. Visits to automotive manufacturing plants can demonstrate the use of computer technology to control both production operations and sophisticated systems within the vehicles.

Automotive Mechanics

Intermediate Division

(Grades 9 and 10)

Students who enrol in automotive mechanics courses in the Intermediate Division will be introduced to the fundamentals of the motor vehicle repair trade. Planning for the courses should meet the needs of students who fall into one or more of the following categories:

- students who take courses at the basic or general level of difficulty for the purpose of acquiring background in servicing, maintenance, and minor repair appropriate to securing employment in service areas of the trade or for personal use;
- students who take courses at the basic or general level of difficulty for the purpose of entering a community college or an apprenticeship in one of the motive-power trades;
- students who take courses at the general or advanced level of difficulty to acquire technical literacy in the automotive field for personal use or as background for college or university courses.

An Intermediate Division course should provide students with exploratory experiences through which they may test their aptitude for and interest in the motive-power trades and acquire the skills and knowledge necessary for success in Senior Division courses. Intermediate and Senior Division courses may lead

not only to apprenticeship but also to a variety of interesting career options ranging from retail or wholesale sales to employment as a technician, technologist, or engineer.

Courses in automotive mechanics are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 1.1.1 identifies the core content for these levels. The core aims and suggestions for designing courses at the basic and general levels are provided in the separate sections that follow. Advanced level courses are authorized as an extension of the core learning for general level courses.

The amount of in-school time allotted for Intermediate Division courses in automotive mechanics may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, the motor vehicle, the engine, fuel systems, and braking systems.

Chart 1.1.1
Core Content for
Automotive
Mechanics
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	Gen / Adv
1. Safety	a	a
2. The motor vehicle	a	a
3. The engine	a	ab
5. Transmission systems		a
6. Wheels and tires	a	ab
7. Steering systems and front axle		a
8. Electrical systems	a	ab
9. Fuel systems	a	ab
10. Ignition systems	a	ab
11. Lubrication systems	a	a
12. Cooling systems	a	ab
13. Braking systems	a	a

Content Units	Core Content for Courses	
	Basic	Gen / Adv
14. Tools and equipment	abcd	abcd
17. Automotive maintenance	a	ac
19. Careers in the transportation industry	ac	abc
20. Applied science		a

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAM1B for Grade 9 and TAM2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a healthy attitude towards good work habits and punctuality, the ability to evaluate critically the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop an increasing awareness of themselves and of their capabilities;
- develop an appreciation for a safe work environment and safe work and dress habits;
- learn to work co-operatively;
- become aware of the benefits to the automotive hobbyist and car owner of a general knowledge of automotive repair;
- become aware of the working relationships among the various shop areas (e.g., welding, machine shop, small engine, and auto body);
- develop skills in the use of hand and power tools, measuring instruments, testing equipment, and other equipment used in the service and repair of automobiles and their components;
- become aware that the field of automotive repair is wide and includes a great variety of job and career opportunities;
- acquire knowledge of apprenticeship and further training opportunities;
- develop an interest in and an aptitude for further training in the field of automotive repair.

Suggestions for Teachers

General safety procedures and student responsibilities relative to activities associated with motive-power equipment should be discussed at the beginning of the course and closely followed. Discussions should address special safety rules related to specific equipment, materials, and environmental situations when the appropriate situations arise. As the course proceeds, students should gain an appreciation of the need to develop work habits and attitudes that will ensure the safety of the individual and the group. The ability to recognize

a hazard and to implement appropriate measures to correct it is a valuable asset to a young worker. Continual emphasis on safety should help to foster the growth of this ability.

Grade 9 courses should be exploratory in nature, whereas Grade 10 courses may begin to develop major themes that can be studied in greater depth in Senior Division courses.

Objectives related to skill development at the basic level of difficulty should be fostered through project work and practical activities

that involve skills basic to the motive-power trades. Repeated opportunities of this type should be provided for students who plan to work in these trades so that they may thoroughly master the skills and knowledge that are fundamental to continued learning in this field. The emphasis on practical applications will also serve to develop the production skills that can benefit students in their transition to employment.

The course objectives planned by the teacher to enable students to accomplish the core learning may be supported by the addition of topics from the list of course content starting on page 38. Topics from this list may also be used to enhance themes that are used as teaching strategies.

Students who are especially talented should be encouraged to tutor and assist other students. These activities will not only help the teacher but also enhance the learning of the students involved.

Students who take courses based on this section with the intention of working in one of the motive-power trades should become acquainted with the apprenticeship requirements, employment opportunities, and various kinds of further training in the motive-power field. Work experience can facilitate these objectives for some students.

As the course progresses, the teacher should make the students aware of the many different

job opportunities that could be open to them: motor vehicle repair mechanic, transmissions and driveline mechanic, steering and brake mechanic, automotive machinist, fuel and electric mechanic, diesel mechanic (heavy duty), auto body mechanic, service station attendant, tire repairperson, lubrication technician, and parts salesperson. In industry, the skills of an auto mechanic have particular relevance in such fields as industrial mechanics.

Some courses offered at the basic level of difficulty may combine elements of technical literacy with preparation for employment. Such courses may support the driver education program or provide a challenging related course to the service station attendant program. These courses generally provide a survey of the subject field with less emphasis on skill development. Courses of this type should include, in addition to the core content outlined in chart 1.1.1, a thorough treatment of unit 18. Topics from units 4, 12, and 23 could also be included.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. Approximately 70 per cent of the student's final mark should be based on the practical components of the course. The criteria for assessing achievement on all projects and other major assignments should be established in advance and conveyed clearly to students.

General Level

Course codes assigned to general level courses planned under this section will be TAM1G for Grade 9 and TAM2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe working procedures and practices while working on an automobile or its components;
- develop confidence in dealing with operations involving automotive repair;

- develop good work habits and satisfaction in completing a job;
- develop attitudes of respect and co-operation towards classmates, teachers, and prospective employers;
- develop language skills (writing, speaking, listening, and reading) through the activities within the automotive shop environment;

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- acquire knowledge and understanding of the location, purpose, and operation of each of the various automotive systems;
 - develop an understanding of and an appreciation for the complexities of the modern automobile;
 - develop the ability to plan and perform tasks efficiently using a logical sequence of steps;
 - develop competence in handling the tools and equipment of the automotive repair trade;
 - develop a general knowledge of the motive-power trade and its various occupations, for vocational and avocational purposes;
 - develop an understanding of the scientific principles that apply to the functioning of automotive systems.
-

Suggestions for Teachers

General safety in the automotive shop should be a primary focus of attention at the beginning of the course. Special safety procedures related to specific components, operations, and situations should be introduced when the appropriate situations arise.

A tidy, well-organized shop with clean floors, and benches free of surplus auto parts, will reduce the possibility of accidents. Extension cords and air hoses should be coiled and hung up after they have been used. Each piece of movable equipment should have a designated location, and it should be returned to that location after it has been used. The first impression a student has of an automotive shop is probably a lasting one, and therefore it is essential that every effort be made to provide a clean, neat, well-organized work environment.

Intermediate Division automotive courses at the general level should provide students with an overview of the automotive trade without being too specific in any given area. These are exploratory years in which many students are sampling a variety of technical areas before embarking on a particular career path.

The course content planned by the teacher to enable the students to meet the set aims and objectives may be supplemented by the addition of other units from "Course Content for the Transportation Grouping", starting on page 38. Topics from this list or from the list for any other subject grouping may be used to enhance any major themes that are used as teaching strategies.

Courses can focus on the various automotive systems – their function, operation, and component parts. Such a teaching strategy provides students with a learning framework

within which they can effectively organize much of the knowledge and skill they acquire in this subject field. The principal features of each automotive system could be surveyed, for example, and a major component of each examined for its function and operation within the system. This strategy can apply not only to power trains and the fuel, electrical, suspension, steering, and braking systems, but also to engine systems. A perspective on spark-ignited and compression-ignited engines that recognizes differences in their combustion processes and commonalities in their operating principles as internal combustion engines can facilitate a generalized understanding of the engine systems (e.g., cooling, lubricating). In general, this approach should aim at helping students to extend their understanding of one type of engine to other types (e.g., from a small gasoline engine to a large diesel engine).

For each theoretical topic or unit, there should be one or more practical projects. At the general level, these should involve removing and replacing units, disassembling, inspecting, and assembling units, or inspecting and adjusting parts or systems. Questioning, whether written or oral, should include the usual how, when, where, what, and why types of questions as well as questions concerning safety procedures and the use of appropriate tools. The practical component of the course can be greatly enhanced by the use of written instructions. These assist students in organizing their efforts and increase their chances of successfully completing the project. Every effort should be made to ensure that the instructions are clear and simple, with each step distinct from the next, to avoid unnecessary confusion and resulting frustration. It should be understood that this type of step-by-step

instruction is difficult for most people to comprehend but extremely important in the automotive repair trade.

The training profile for the trade of motor vehicle mechanic, available through the provincial Linkage program, identifies terminal performance objectives and criteria that provide the basis for apprenticeship training programs in Ontario. This training profile is a useful resource for the teacher planning initial courses for students who plan to enter the trade as apprentices. The performance objectives outlined in the training profile for the basic course of the apprenticeship program are authorized as curriculum content for courses based on this section. Students who take courses that incorporate these performance objectives and that are registered in the Linkage program for the motor vehicle mechanic trade may earn training credits that will excuse them from the basic in-school course for motor vehicle mechanic apprentice. It is possible to plan the series of courses in a secondary school motor vehicle mechanics program over three or four years (starting in Grade 9 or 10) so that students can satisfactorily achieve the terminal performance criteria for the complete basic course normally covered by apprentices in eight weeks of full-time attendance at college. It should be noted that the terminal performance objectives and criteria in the training profile are specified at the general level of difficulty. Further information on the Linkage program is available from the directors of the Ministry of Education's regional offices.

Where students have enrolled in automotive mechanics courses with the intention of entering apprenticeships as heavy-duty-equipment mechanics after graduation, the training profile for that trade (published by the Skills Development Division, Ministry of Colleges and Universities) can serve as a useful planning resource for the teacher. Performance objectives outlined in the training profile for the basic course in the apprenticeship program for the heavy-duty-equipment mechanic trade are authorized as curriculum content for courses based on this guideline. Considerable commonality exists between these objectives and those outlined in the motor vehicle mechanic training profile.

Technical literacy courses should be planned to serve the needs of potential motor vehicle owners and of those students planning post-secondary studies at colleges or universities in professional fields that have links to the transportation industry. A course of this type may be the only technical course taken by some students in secondary school. These courses generally provide a survey of the subject field with less emphasis on skill development. Courses of this type should include, in addition to the core content outlined in chart 1.1.1, a thorough treatment of unit 16. Topics from unit 4 can also be included.

The evaluation of students in the general level programs should emphasize practical aspects of the course; 65 per cent of a student's mark should reflect practical learning, 35 per cent theoretical learning.

Advanced Level

Course codes assigned to advanced level courses will be TAM1A for Grade 9 and TAM2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe personal work habits and a positive attitude towards maintaining a safe environment for others in the workplace;
- develop knowledge about, and skill in using, hand tools, power tools, and other equipment common in the automotive industry;
- acquire knowledge and understanding of the functional roles of the various automotive systems and the relationships among them;

-
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
 - apply acquired knowledge of mathematics and scientific principles to automotive systems;
 - acquire skills in researching technological ideas and communicating findings in written reports and oral presentations;
 - acquire an overview of the occupational opportunities available in the automotive industry and an understanding of educational and training requirements for these occupations.
-

Suggestions for Teachers

The core content for courses in automotive mechanics at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 1.1.1. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is usual in general level courses. This difference in focus should be reflected in the objectives set for the course by the teacher.

Where time permits, optional content may be selected from other subjects within the transportation grouping or from related subjects, such as applied electricity and machine shop practice, from other groupings. The optional content in each case should be selected to fit learning objectives planned for the course

or particular themes selected as teaching strategies. In all cases, the content should suit the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of these topics as independent study, particularly in bi-level courses, where advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various automotive topics should be included in the course.

Automotive Mechanics

Senior Division

(Grades 11 and 12)

Courses in automotive mechanics for the Senior Division may be offered at the basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the Grade 11 and Grade 12 components of the guideline for auto mechanics, *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963*.

Senior Division courses may include additional topics from the units listed under "Course Content for the Transportation Grouping" (pages 38 to 42) or from any other subject grouping in Part B of the technological studies guideline. Courses in this subject area will have the three letters TAM as the stem of their course code.

The in-school training for apprenticeship in the motive-power trades begins with a broad core of learning and moves on to specialized training for the various trades. Senior Division courses in automotive mechanics should attempt to reinforce this approach. The training profile for motor vehicle mechanic, available through the provincial Linkage program, is

a useful resource in this regard. Any terminal performance objective outlined for the basic apprenticeship course in the training profile *Motor Vehicle Mechanic* may be included in courses planned for the Senior Division. The training profile and information on the Linkage program are available from the directors of the regional offices of the Ministry of Education.

School-related packages in automotive mechanics, planned to lead either to apprenticeship or to technician training in the motive-power industry, should be planned to include courses in the features of electronics and fluid power control related to automotive mechanics. As the technology of the motive-power industry changes, background knowledge in these two subject fields becomes increasingly important.

Auto Body Repair

Intermediate Division

(Grades 9 and 10)

Courses planned for this subject in the Intermediate Division are intended to introduce students to the trade of auto body repair. Students have the option of either simply learning to perform simple auto body repairs or developing the skills and knowledge needed for further courses in the Senior Division – courses that can lead to an apprenticeship. Other courses that can broaden skills and knowledge for students interested in a career in auto body repair are automotive mechanics, sheet metal, and welding. Learning experiences in the introductory courses for this subject should explore the spectrum of occupations related to auto body repair work, including apprenticeship in the trade. Students should be provided with the opportunity to enrol in the Linkage program for auto body repairer. The student who masters the trade will have opportunities for successful employment in such positions as auto body shop supervisor, parts person, paint refinisher, and insurance company appraiser. Alternatively, such a person might become the owner and operator of his or her own business.

Courses in auto body repair are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 1.1.2 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in auto body repair may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, tools and equipment, metal working for auto body repair, and welding for automotive repair.

Chart 1.1.2
Core Content for
Auto Body Repair
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	a	a
14. Tools and equipment	ade	ade
15. Customer relations and business procedures	a	ab
19. Careers in the transportation industry	a	ab
20. Applied science		c
21. Metal working for auto body repair	a	ab
22. Welding for automotive repair	a	ab
23. Auto body construction and trim	a	ab
26. Preparation for refinishing	a	a
27. Painting	a	ab

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAB1B for Grade 9 and TAB2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in the quality of their work, the ability to work co-operatively, and respect and care for customers' and employers' property;
- develop a positive attitude towards themselves;
- develop safe work habits and practices in the use of the protective clothing, equipment, tools, and chemical materials of the auto body repair trade;
- develop manipulative dexterity in the use of hand and power tools, measuring instruments, gas welding equipment, and other common auto body shop equipment;
- develop the skills required to reduce enamel and acrylic lacquer paints for painting on test panels in the shop area;
- acquire a perspective on the automotive industry and knowledge of the various career opportunities within it.

Suggestions for Teachers

Students studying at the basic level of difficulty often require a great deal of encouragement. In many cases, they have experienced a certain degree of failure in their schooling and therefore have developed a rather poor self-image. Their schooling problems often are directly related to their poor verbal skills. If they are given the opportunity to become involved in a program that has a high level of activity and a limited number of written assignments, they are capable of extremely good work. Teachers should be aware of this fact and plan short lessons and a highly active auto body program. Objectives related to skill development should be fostered through practical projects. Repetition is essential for mastery.

Special safety procedures related to specific components, operations, and situations should be introduced when the appropriate circumstances arise. Only general shop safety should be of concern at the beginning of the course. As the course proceeds, students should gain an appreciation of the ongoing need to develop work habits and attitudes that will ensure the safety of the individual and the group. The ability to recognize a hazard on the job and to implement the necessary measures to correct it is a valuable asset to a young worker — an asset that can be systematically acquired in courses under this section.

Courses offered at the basic level of difficulty may vary with the type of shop facility. It is important, in courses at this level of difficulty, to introduce a variety of occupational skills, because the student may start work in any of a wide range of related occupations. Welding techniques may be applied to patching a panel that has rusted through or to other activities identified as optional content in unit 21, listed at the end of this module under "Course Content for the Transportation Grouping". These activities can also be related to the general field of metal fabrication. Similarly, when the core content has been accomplished, optional topics on fibreglass repair from unit 25, including the customizing of vehicles, may be included. Skills developed in the fibreglass area can also have fairly wide application to other occupations. On the other hand, skills developed through an emphasis on optional topics related to glass installation in unit 24 would be more specialized to the trade.

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 21 through 27, listed at the end of this module. Additional topics from these units may also be used to enhance major themes used as teaching strategies.

All courses offered under the subject auto body repair will include welding. It may be taught as a related course or as an integral part of the auto body course. Topics in unit 22(a) (see page 40) should be considered as a minimum requirement for students studying at the basic level of difficulty.

A number of excursions can be planned for the school year. These may include a trip to a car assembly plant and/or a large automotive dealership with a body shop. A visit to a smaller body shop may also be planned, to show the student the importance of these facilities in the automotive industry today and the possibility of owning a small auto body shop. Older students can benefit from work experience on the job. Both kinds of experiences should be planned in advance to reinforce skills that students have acquired through the course. As well, openings in the local auto body industry may occur that enable some students to work part-time as paint refinishers' helpers, performing tasks such as masking a vehicle and sanding surfaces in preparation for painting.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. The criteria for assessing achievement on all assignments should be established in advance and conveyed clearly to students.

A course offered at the basic level of difficulty to students who plan to enter apprenticeship in the auto body repair trade must provide students with opportunities to experience and

acquire skills and knowledge that are fundamental to the trade. The training profile for the trade of auto body repairer, prepared by the Skills Development Division of the Ministry of Colleges and Universities, is a useful resource for the teacher planning courses of this type. Information on the Linkage program that is based on this auto body training profile is available from the directors of the Ministry of Education's regional offices. The training profile identifies terminal performance objectives and criteria that provide the basis for apprenticeship training programs in Ontario. The performance objectives for the initial or basic course of the auto body repair apprenticeship program, outlined in the training profile, are authorized as curriculum content for courses based on this section. Students who take courses that incorporate these performance objectives and that are registered in the Linkage program for the auto body repairer trade may earn training credits that will excuse them from the basic in-school course normally taken by apprentices in this trade. It is possible to plan the series of courses in a secondary school auto body repair program over three or four years (starting in Grade 9 or 10) so that students can satisfactorily achieve the terminal performance criteria for the complete basic course – criteria normally met by apprentices in eight weeks of full-time attendance at college.

Students taking courses based on this section should be informed of the apprenticeship requirements for auto body repairer, the procedure for securing an apprenticeship, local job opportunities, and postsecondary programs in the field.

General Level

Course codes assigned to general level courses planned under this section will be TAB1G for Grade 9 and TAB2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;

- develop a co-operative attitude towards their fellow workers and supervisors;
- develop a knowledge of design characteristics, types of auto body construction, and the technical and trade names of body parts;

- develop safe work habits and practices in the use of the protective clothing, masks, equipment, hand and power tools, chemical materials, and equipment involved in air supply and sand blasting;
- learn the techniques of metal working and repair on vehicle body shells, developing fine control in the use of all basic hammers, spoons, and hand dollies;
- acquire knowledge and understanding of the types, purposes, and compositions of re-finishing materials and develop the skills required to prepare a vehicle for acrylic or enamel paint;
- develop skill in the use of welding equipment;
- acquire knowledge of the preparation and mixing of a variety of paints, including enamel, acrylic lacquer, acrylic enamel, and clear coat;
- learn how the scientific principles of fluid power, heat, and energy operate in the auto body trade;
- develop a perspective on the area of the automotive industry pertaining to sales, parts, and estimating on collision repair and become aware of the various career opportunities in this expanding automotive field.

Suggestions for Teachers

Grade 9 courses should be exploratory in nature, whereas Grade 10 courses may begin to develop major themes that can be studied in greater depth in Senior Division courses.

Teachers planning courses at the general level of difficulty should refer to the suggestions for teachers in the section for the basic level of difficulty in this subject.

Courses offered at the general level of difficulty should be oriented mainly towards practical activities, with the limited amount of theory related directly to various aspects of the auto body trade. Courses offered for technical literacy should provide a survey of the subject field, with less emphasis on skill development.

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 21 through 27, listed at the end of this module (pages 40-41). Additional topics from these units may also be used to enhance major themes that are used as teaching strategies.

Because it is suggested that a strong emphasis be placed on the practical aspects of the general level program, it follows that the evaluation of the student should also be weighted

towards practical activities. Approximately 70 per cent of the final mark should be based on this aspect of the program.

Safety is an important feature of the auto body program. Students should be made aware of the safety checks involved in every operation they perform. They should be instructed on what type of safety equipment should be worn and made aware of the proper procedure for adjusting the equipment to achieve a proper fit. The shop should be kept in an orderly condition, with extension cords, air hoses, and portable equipment properly stored when not in use.

Maintenance of dust-free conditions is always a concern in an auto body repair shop, and therefore it is important that the air-cleaning equipment be kept in proper running order.

For comments about apprenticeship training and the provincial Linkage program, see "Suggestions for Teachers" in the preceding section for basic level courses.

Auto Body Repair

Senior Division

(Grades 11 and 12)

Courses in auto body repair for the Senior Division may be offered at the basic and general levels of difficulty. Planning for these courses will continue to be based on the Grade 11 and Grade 12 components of the guideline on auto body repair, *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963*.

Senior Division courses may include additional topics from the units listed under "Course Content for the Transportation Grouping" (pages 38 to 42) or from any other subject grouping in Part B of the technological studies guideline.

The training profile for auto body repairer, available through the provincial Linkage program, is a useful resource for all Senior Division courses. Any terminal performance objectives outlined for the basic apprenticeship course in the training profile *Auto Body Repairer* may be included in courses planned for the Senior Division. The training profile and information on the Linkage program are available from the directors of the regional offices of the Ministry of Education.

Small Engines

Intermediate Division

(Grades 9 and 10)

Small engines are defined for the purpose of this subject as portable or stationary internal combustion engines of a size and horsepower suitable for powered equipment. Small engines of this type, incorporating the two- and four-stroke principles, are widely employed as power sources for equipment in forestry, agriculture, construction, and recreation. Gardeners, home-owners, small contractors, and general-maintenance persons all depend on reliably serviced equipment. Although employment in the small engine repair field is limited and tends to concentrate in particular areas of the province, most students who take these courses will become owners or users of products powered by small engines and will be able to use their skill and knowledge for personal purposes.

Courses in small engines are authorized for Grades 9 and 10 at the basic and general levels

of difficulty. Chart 1.1.3 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in small engines may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, the engine, tools and equipment, and small engines – trouble-shooting and repair.

Chart 1.1.3

Core Content for

Small Engines

Intermediate Division

(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	a	a
3. The engine	ac	ad
14. Tools and equipment	ab	ab
19. Careers in the transportation industry	a	ab
20. Applied science		a
28. Small engines – trouble-shooting and repair	a	ab
29. Small engines – systems	a	abc

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAE1B for Grade 9 and TAE2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop good work habits and a sense of satisfaction in a job well done;

- gain insight into their mechanical abilities;
- develop the ability to work co-operatively with others in an atmosphere of respect;
- develop safe work habits and practices, particularly in relation to toxic and explosive

-
- fumes, the use of tools and equipment, accidental starting of units, and safety precautions specified in manufacturers' manuals relative to driving mechanisms and the driven units;
 - develop an understanding of the operating principles of internal combustion engines;
 - acquire knowledge and skill in the safe handling, operation, maintenance, repair, and proper storage of portable and stationary small engines of all types;
 - develop a familiarity with the variety of vocational opportunities that involve small engines.
-

Suggestions for Teachers

It is important for teachers to be aware of and sympathetic towards the personal characteristics of students that may have had an effect on their learning abilities. These include poor self-image, short attention span, poor social skills, and physical or emotional disorders.

Grade 9 courses should be exploratory in nature, providing as wide a range of core learning experiences as possible within the course time allotted.

The course objectives planned by the teacher to accomplish the core learning may be supported by additional topics selected from units 5, 8, 20, and 25, which are listed at the end of this module under "Course Content for the Transportation Grouping" (starting on page 38). Topics from these units may also be used to enhance major themes, such as outboard or industrial applications, that are used as teaching strategies.

Special safety rules related to specific equipment, materials, and environmental situations should be introduced when the appropriate circumstances arise. General safety procedures and health awareness relative to activities associated with motive-power equipment, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course.

Courses offered at the basic level of difficulty should focus on practical activities related to a variety of small engine applications, with initial emphasis on the basic small engine (four-stroke cycle). The experiences associated with these activities must provide opportunities for students to acquire and master the skills and knowledge that are basic to the trade. Activities may include disassembling

and assembling engines and various components; servicing and properly adjusting lubrication, cooling, fuel, and ignition systems; doing tune-ups; and trouble-shooting. Activities that develop techniques for performing minor metal and fibreglass repairs to housings and mounts of industrial small engines may also be included where appropriate.

Student learning associated with the theory of small engines can be readily related to learning in other subjects in the transportation grouping. An understanding of the operating principles of reciprocating engines, developed by students taking small engine courses at either level of difficulty, forms a useful base on which further learning can be developed in automotive repair, service station attendant, or agricultural equipment servicing courses. This transfer of learning can be facilitated for students by teachers of related courses. Opportunities for such facilitation are particularly available at the basic level of difficulty, where some related courses may be taught by the same teacher.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. Assessment at the basic level should reflect the courses' emphasis on the practical aspects of the subject. Approximately 70 per cent of the student's final mark should be based on the practical component. The criteria for assessing achievement on all aspects of student work and assignments should be established in advance and conveyed clearly to students.

Students who take courses based on this section with the intention of working in one of the motive-power trades should become acquainted with the apprenticeship requirements,

employment opportunities, and various kinds of further training in the motive-power field.

Work experience or co-operative education can facilitate these objectives for some students.

General Level

Course codes assigned to general level courses planned under this section will be TAE1G for Grade 9 and TAE2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, an ability to evaluate critically the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop safe work habits and practices, particularly in relation to toxic and explosive fumes, use of tools and equipment, accidental starting of units, and safety precautions specified in manufacturers' manuals relative to driving mechanisms and the driven units;
- develop an understanding of the operating principles of internal combustion engines;
- acquire knowledge and skill in the safe handling, operation, maintenance, repair, and proper storage of portable and stationary small engines of all types;
- acquire an understanding of the scientific principles that govern the operation of small engines;
- develop a familiarity with the variety of vocational opportunities that involve applications of small engines;
- develop an overview of the small engines industry and a general knowledge of the various careers and training opportunities within it.

Suggestions for Teachers

Grade 9 courses should be exploratory in nature, providing as wide a range of core learning experiences as possible within the course time allotted.

The course objectives planned by the teacher to accomplish the core learning may be supported by additional topics selected from units 5, 6, 8, 13, 15, 16, 20, and 22, listed under "Course Content for the Transportation Grouping" at the end of this module.

Where students take related courses in automotive repair, service station attendant, or agricultural equipment servicing, the transfer of learning related to common concepts, including scientific concepts, can be facilitated for students by teachers. Objectives related to understanding the science of small engines should be incorporated as part of the general learning strategy throughout the course and not treated in isolation.

The general level program should provide an appropriate balance of practical and theoretical

work. Although a little more theory may be involved than at the basic level, the course should be heavily weighted towards practical work.

Activities may include preparing outboards for winter storage; disassembling and assembling engines and various components; servicing and properly adjusting lubrication, cooling, fuel, and ignition systems; doing tune-ups; and trouble-shooting. Activities that develop techniques for performing minor metal and fibre-glass repairs to housings and mounts of industrial small engines may also be included where appropriate.

Students should become familiar with the use of manufacturers' manuals. They should develop the ability to locate information in these manuals about the manufacturers' specifications. Manual recommendations for maintenance and repair, and information about ordering parts and components, should be used extensively.

Small Engines

Senior Division

(Grades 11 and 12)

Courses in small engines for the Senior Division may be offered at the basic and general levels of difficulty. Planning for these courses will continue to be based on the Grade 11 component of the curriculum guideline on small engines and the Grades 11 and 12 component of the guideline on auto mechanics, *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963*.

When planning courses for the Senior Division, teachers may include additional topics from the units listed under "Course Content for the Transportation Grouping" (pages 38 to 42) or from any other subject grouping in Part B of the technological studies guideline.

The in-school training for apprenticeship in the motive-power trades first develops a broad common core of learning and then offers specialized training for the various trades. Senior Division courses in small engines should attempt to reinforce this approach. The training profile for motor vehicle mechanic, available through the provincial Linkage program, is a useful resource in this regard. The training profile and information on the Linkage program are available from the directors of the regional offices of the Ministry of Education.

Service Station Attendant

Intermediate Division

(Grades 9 and 10)

Courses based on this subject are intended to introduce students to the skills and knowledge required for the trade of service station attendant. The nature of the occupations associated with this trade has changed steadily. Small service stations have been replaced by multi-pump stations that offer a wide range of maintenance and repair services. The trend to self-serve stations has led in turn to a reduction in both the number of full-service establishments and the overall need for the gas pump services offered by attendants. As part of this trend, separate automobile centres that offer accessories and specialized automobile services have appeared in urban centres. These establishments continue to need the general-maintenance services offered by service station

attendants. Students who take courses based on this subject should acquire a good perspective on the present motive-power service industry for personal vehicles and a knowledge of the opportunities for employment and further training that exist in this field.

Service station attendant courses are authorized for Grades 9 and 10 at the basic level of difficulty. Chart 1.1.4 identifies the core content for this level. The core aims and suggestions for designing courses at this level are provided in the section that follows the chart.

Service station attendant courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 1.1.4
Core Content for
Service Station
Attendant
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses
	<i>Basic</i>
1. Safety	a
2. The motor vehicle	a
6. Wheels and tires	a
11. Lubrication systems	a
12. Cooling systems	a
14. Tools and equipment	abcd
15. Customer relations and business procedures	a
16. Parts-department practice	a
17. Automotive maintenance	ab
18. Owning an automobile	a
19. Careers in the transportation industry	ac

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAS1B for Grade 9 and TAS2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the knowledge, skills, and personal characteristics required to work co-operatively and productively on the job;
- develop awareness and proper practices relative to safety and health in the workplace;
- be introduced to the knowledge and skills of automotive servicing required by a trainee for service station attendant;
- develop familiarity with the selection and use of hand and machine tools;
- develop self-confidence in attempting a new task;
- acquire a perspective on the automotive industry and knowledge of the various career opportunities within it.

Suggestions for Teachers

Grade 9 courses should be exploratory in nature, providing an overview of the automotive services industry and relating to this overview as wide a range of core learning experiences from this guideline as is possible in the course time allotted. The core learning should give students some basic knowledge of and skills in the subject field as well as the learning skills they will need in order to extend their studies in this subject field.

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 3, 5, 8, 9, 10, 20, and 23, which are listed at the end of this module under “Course Content for the Transportation Grouping”. Optional topics from these units may also be used to enhance major themes that may be used as teaching strategies.

The Grade 10 courses may begin to develop major themes that can be studied in greater depth in Senior Division courses. Typical themes are automotive servicing, service station operation, technical sales (of automotive supplies), and installation of automotive accessories.

General safety in the automotive shop should be given considerable attention at the beginning of the course. Special safety procedures

related to specific components, operations, and situations should be introduced when the appropriate circumstances arise. As the course proceeds, students should gain an appreciation for the need to develop safe work habits and attitudes for the overall safety of the individual and the group. The ability to recognize a hazard and to implement measures to assure a safe and healthy environment on the job are valuable assets in a young worker.

Intermediate Division courses in this subject should focus on practical activities related to a variety of the duties performed by service station attendants. The experiences associated with these activities should be planned to provide opportunities for students to acquire and master skills and knowledge that are basic to the trade. Activities may include lubricating vehicles, repairing tires, balancing wheels, replacing complete exhaust systems or parts, and maintaining batteries, spark plugs, cooling systems, belts, and hydraulic levels.

Unit 20 of the course content for the transportation grouping includes topics in applied science that can provide useful background for the service station attendant. Practical activities in the course should lead to some familiarity with scientific vocabulary related to motor vehicles. This familiarity could include

some understanding of the chemicals listed on common labels, the physics associated with the installation and functioning of automotive materials and parts, the reading of temperature and various meter scales, the estimation of physical quantities, the conversion of data, and the function and operation of fire extinguishers.

Students who take courses based on this section with the intention of working in one of the motive-power trades should become acquainted with the apprenticeship requirements, employment opportunities, and alternative types of further training in the motive-power field. Opportunities to acquire this information should be planned as part of the course work.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. Assessment at the basic level should reflect the courses' emphasis on the practical aspect of the subject. Approximately 70 per cent of the student's final mark should be based on the practical component. The criteria for assessing achievement on all aspects of students' projects and assignments should be established in advance. It is important that students understand these criteria before they begin any assignment.

Service Station Attendant

Senior Division

(Grades 11 and 12)

Courses that are offered to students who plan to enter an apprenticeship must provide them with opportunities to acquire skills that are basic to the trade. Occupations in the motive-power trades require various kinds of knowledge and skills, which have been identified by the industry as performance objectives for trainees. These are outlined in training profiles developed by the Skills Development Division, Ministry of Colleges and Universities. Objectives outlined in the basic courses for motor vehicle mechanic constitute a useful core of the knowledge and skills required in most motive-power trades (including service station attendant). Information on the training profile for motor vehicle mechanic is available from the directors of the Ministry of Education's regional offices. Performance objectives listed in the basic course for motor vehicle mechanic, which may be adapted to Senior Division courses in service station attendant, can help students to identify, select, use, and maintain the hand tools, power tools, and shop equipment commonly required for the service and repair of motor vehicles; to acquire

a knowledge of shop practice relative to safety and health hazards, the principles of shop systems, and applied business procedures; and to gain a working knowledge of the fundamental principles of internal combustion engines and some familiarity with the various automotive systems. The use of the motor vehicle mechanic profile also provides an opportunity to make students aware of the particular repair activities that only licensed motor vehicle mechanics are authorized to perform for the public.

Service station attendant courses are authorized for Grades 11 and 12 at the basic level of difficulty. Chart 1.1.5 identifies the core content for this level. The section that follows the chart provides the core aims and suggestions for designing courses at this level.

Service station attendant courses for Grades 11 and 12 may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 1.1.5
Core Content for
Service Station
Attendant
Senior Division
(Grades 11-12)

Content Units	Core Content for Courses
	<i>Basic</i>
1. Safety	ab
2. The motor vehicle	a
3. The engine	ab
5. Transmission systems	a
6. Wheels and tires	a
7. Steering systems and front axle	a
9. Fuel systems	a
10. Ignition systems	a
11. Lubrication systems	a
12. Cooling systems	a
14. Tools and equipment	abcd
15. Customer relations and business procedures	ab
16. Parts-department practice	a
17. Automotive maintenance	abc
18. Owning an automobile	a

Content Units	Core Content for Courses
	<i>Basic</i>
19. Careers in the transportation industry	ac
22. Welding for automotive repair	a
28. Small engines – trouble-shooting and repair	a

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAS3B for Grade 11 and TAS4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop social and interpersonal skills they will need in order to acquire and keep a job;
- appreciate the importance of developing safe work habits and procedures in the shop;
- select, use correctly, and maintain properly the tools and/or equipment required to complete jobs performed by service station attendants;

- develop a knowledge of the management and operational policies generally used in automotive service stations;
- acquire a knowledge of appropriate techniques for establishing and maintaining good customer relations and selling automotive products and services;
- develop the ability to plan and perform tasks efficiently.

Suggestions for Teachers

Core and optional topics should be studied at progressively greater depth and breadth in successive courses based on this section. This approach continues into later training programs, which extend the knowledge and skills that students have already learned while stressing practical details and industry requirements.

Themes developed in Senior Division courses may explore the general skill areas involved in the work of service station attendants. Several themes may be handled simultaneously. These could relate to both service station operation and the sale of automotive parts and services. The average employer in the motive-power servicing field seeks new employees

who understand sales techniques, are able to communicate with customers, have a reasonable level of product knowledge, are able to handle cash, and can follow basic stock-and sales-control procedures. These techniques and knowledge areas should receive continual emphasis when course objectives are planned around general skill themes.

Whenever possible, students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students.

Older students who are enrolled in Senior Division courses based on this section should be encouraged to take driver education as a

related study. The driver's licence is a requirement for employment in many service station attendant jobs.

The learning, in both theory and skill development, acquired during practical activities should continue to receive recognition in the evaluation of student achievement. The criteria for assessing achievement on all projects and assignments should be established in advance. It is important that students understand these criteria before they begin any assignment.

Safety procedures identified in the Intermediate Division courses should continue to be developed in the Senior Division years. General safety in the automotive shop should be given considerable attention at the beginning of the course. Special safety procedures related to specific components, operations, and situations should be introduced when the appropriate circumstances arise. As the course proceeds, students should develop safe work habits and attitudes. The ability to recognize a hazard and to implement measures to assure

a safe and healthy environment on the job are valuable assets in a young worker. It is vital to foster in each student a positive attitude towards safe practices.

Work experience can benefit students at any point in their Senior Division course work, particularly when such experiences develop the students' confidence about working independently on assigned tasks. Early work experiences can help students to explore careers in the subject field, whereas later experiences can reinforce and further develop particular objectives of the course. All work experience, whether gained through co-operative education placements or through part-time work, can improve students' chances for employment and career success after graduation.

Agricultural Equipment Servicing

Intermediate Division

(Grades 9 and 10)

The modern farm demands diverse knowledge and skills on the part of those who work it. Farm machinery has become increasingly complex and expensive, and a farmer who can maintain equipment properly and carry out simple repairs is at a considerable advantage, in both time and money. The agricultural equipment industry itself encompasses numerous and diverse vocations.

Courses based on this subject should enable students to acquire fundamental practical skills and theoretical knowledge related to owning, operating, and maintaining agricultural equipment and farm machinery, with safety always in mind.

The Intermediate Division program will serve students who seek some technical competence for personal use, as well as students who seek preparation for courses in the Senior Division that can provide them with information and guidance regarding the various career opportunities within the field of agriculture.

Courses in agricultural equipment servicing are authorized for Grades 9 and 10 at the basic and general levels of difficulty. Chart 1.1.6 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, the engine, tools and equipment, and automotive maintenance.

Chart 1.1.6
Core Content for
Agricultural
Equipment Servicing
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	a	a
3. The engine	a	ab
14. Tools and equipment	abcd	abcd
17. Automotive maintenance	a	a
19. Careers in the transportation industry	ad	abd
20. Applied science		ab
31. Farm machinery	a	ab

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAG1B for Grade 9 and TAG2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop an increasing awareness of themselves and of their capabilities;
- develop a positive attitude towards good work habits and punctuality;
- develop the ability to understand the sequence of steps necessary to complete an assigned task;
- be introduced to a variety of hand and machine tools involved in the maintenance and repair of agricultural equipment;
- develop the ability to listen and to follow instructions;
- acquire an appreciation of good agricultural machinery design and, as an operator of such equipment, develop pride in proper maintenance of it;
- acquire a perspective on the motive-power and agricultural equipment industries and knowledge of the various career opportunities within them.

Suggestions for Teachers

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 6, 8, 11, 12, 16, 20, and 33, listed at the end of this module under “Course Content for the Transportation Grouping”. Additional topics from these units may also be used to enhance particular themes that may be used as teaching strategies, but the treatment of these topics should be adjusted to the basic level of difficulty.

Intermediate courses at the basic level of difficulty should be exploratory in nature, providing an overview of the agricultural equipment industry and relating to this overview as wide a range of core learning experiences from this section as possible in the course time allotted. The core learning should give students some basic knowledge of the subject field as well as the learning skills they will need in order to extend their studies in this subject field. Grade 10 courses may begin to develop major themes that can be studied in greater depth in Senior Division courses. Typical themes that may be developed are farm equipment and farm machinery servicing.

Safety considerations should be of primary concern for students enrolled in any course in agricultural equipment servicing. The development of safe work habits and attitudes by all student workers is essential if a safe and healthy work environment is to be assured. Special safety procedures related to specific components, operations, and situations should be introduced when the appropriate circumstances arise.

Practical activities related to the maintenance of a variety of farm machinery should form the strategy for teaching basic level courses in the Intermediate Division. These experiences should enable students to acquire the associated skills and knowledge, to develop some perspective on the varieties of farm equipment, and to acquire an awareness of the range of opportunities associated with the industry.

Arrangements can sometimes be made to borrow pieces of agricultural equipment from dealers or local farmers for a short period during the off-season.

Excellent manuals on various aspects of agricultural equipment servicing are available from manufacturers. The ability to use these

is essential to the continuing education of both students and teachers of this subject.

The evaluation of students at the basic level should be strongly weighted towards the practical component of the program.

Approximately 70 per cent of the term mark should be derived from practical work and 30 per cent from theoretical work.

General Level

Course codes assigned to general level courses planned under this section will be TAG1G for Grade 9 and TAG2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop mature and responsible work habits, particularly in the areas of personal safety and safety of others;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- acquire basic manual skills in the use of hand and power tools, maintenance equipment, and measuring instruments employed in agricultural equipment servicing;

- develop the ability to read and accurately interpret printed information about the construction and operation of machinery and equipment;
- acquire an understanding of the scientific principles related to the various systems and an appreciation of the associated technology;
- develop an appreciation of good agricultural machinery design and an understanding of the many principles and functions involved;
- acquire a perspective on the motive-power and agricultural equipment industries and knowledge of the various career opportunities within them.

Suggestions for Teachers

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 6, 8, 11, 12, 16, 20, 22, and 33, which are listed at the end of this module under “Course Content for the Transportation Grouping”. Additional topics from these units may also be used to further develop and enrich the major themes that may be used as teaching strategies in these courses. All topics should be treated at a depth appropriate to the general level of difficulty.

The general level program in agricultural equipment servicing should attempt to familiarize students with all of the major pieces of equipment that exist on a typical farm. To do this, the program should include field trips to local farms or to nearby dealerships. In either case, it is important that students acquire some first-hand knowledge about the general size and power of agricultural equipment. The

students should also gain some hands-on experience with both gasoline and diesel engines and basic auxiliary systems that work in conjunction with these power sources. Students should also have the opportunity to repair and replace blunt or worn parts of tillage equipment and to become involved in the calibration of planting, spraying, and fertilizing equipment.

Safe work habits in servicing, repairing, and operating agricultural equipment must be continually stressed. There are many excellent safety posters available, and these should be put on display in the shop. It is important that the shop be kept clean and that unused equipment be properly stored in a designated location.

Courses offered at the general level of difficulty in the Intermediate Division can introduce students to activities associated with the

trade of farm equipment mechanic. When planning courses of this type, the teacher will find the training profile for farm equipment mechanic, prepared by the Ministry of Colleges and Universities, a useful resource. This profile identifies terminal performance objectives and criteria that provide the basis for apprenticeship training programs for the trade in Ontario. The performance objectives outlined in the profile for the basic course for farm equipment mechanic are authorized as curriculum content for courses based on this section. Students taking these courses should be made aware of the procedure for securing an apprenticeship for farm equipment mechanic, of local job opportunities, and of postsecondary training programs that offer continuing study in the field.

Topics from unit 33 can be developed to provide students with useful background knowledge for discussing the appropriate applications of agricultural equipment. Additional topics listed at the end of the horticulture module may also serve this purpose.

Arrangements can sometimes be made to borrow pieces of agricultural equipment from dealers or local farmers for a short period during the off-season.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. The criteria for assessing students' achievement on all aspects of major assignments should be established in advance. It is important that students understand these criteria before they begin any assignment.

Agricultural Equipment Servicing

Senior Division

(Grades 11 and 12)

Courses in this subject should enable students to acquire fundamental skills and knowledge related to the maintenance and servicing of agricultural equipment. Courses offered at the basic level of difficulty can provide operators of farm equipment with the knowledge and skills they require for servicing and maintaining such equipment. Courses offered at basic or general levels of difficulty can also serve students who seek general technical competence in this subject field, by increasing their familiarity with the technology of agricultural equipment.

Courses in agricultural equipment servicing are authorized for Grades 11 and 12 at the basic and general levels of difficulty. Chart 1.1.7 identifies the core content for these

levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, the engine, tools and equipment, automotive maintenance, and farm machinery.

Chart 1.1.7
Core Content for
Agricultural
Equipment Servicing
Senior Division
(Grades 11-12)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	a	a
3. The engine	ab	ab
14. Tools and equipment	abcde	abcde
17. Automotive maintenance	ac	ac
19. Careers in the transportation industry	ad	abd
20. Applied science	a	abc
30. Farm tractors – power trains and control systems	a	ab
31. Farm machinery	ab	ab
32. Estimating and farm equipment shop management		a
33. Soils, crops, and water management		a

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TAG3B for Grade 11 and TAG4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a high level of competence in performing a task and a sense of satisfaction in seeing it completed;
- develop an appreciation of the knowledge and skills necessary to become a successful service mechanic;
- develop the ability to complete a job effectively with a limited amount of instruction;
- work with others in a co-operative and efficient manner;
- acquire the skill and knowledge necessary to perform simple service and repair tasks on agricultural equipment;
- develop the basic principles of troubleshooting and a knowledge of the test equipment necessary to perform such tasks;
- acquire knowledge and understanding of the functions and general operation of the various systems that make up agricultural equipment;
- develop an understanding of the requirements of good customer relations and the fundamentals of proper business practice.

Suggestions for Teachers

The course objectives planned by the teacher to allow students to accomplish the Senior Division core learning may be supported by additional topics selected from units 6, 8, 11, 12, 16, 20, 22, and 33, which are listed at the end of this module under “Course Content for the Transportation Grouping”. Additional topics from these units may also be developed to support themes that are planned as teaching strategies. All topics should be adjusted to the basic level of difficulty.

The core learning outlined for Intermediate Division courses in this subject is fundamental to Senior Division courses. The topics listed as the core content for Intermediate Division courses may be treated at greater depth in the Senior Division and may be augmented by additional topics selected from the course content. In this program, both core and optional topics should be studied at progressively greater depth and breadth in successive units and courses.

Whenever possible, students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students.

Work experience can benefit students at any point in their Senior Division course work, particularly when such experience develops the students’ confidence about working independently on assigned tasks. Early work experiences can help students to explore careers in the subject field, whereas later experiences can reinforce and further develop particular objectives of the course. All work experience, whether gained through co-operative education placements or through part-time work, can improve student chances for employment and career success after graduation.

Safety must be continually stressed at the Senior Division level, particularly in situations involving the operation of agricultural equipment. When students are participating in work experience or co-operative education, it is essential that they be made aware of the hazards involved in working around heavy agricultural equipment. Methods of raising and securing equipment when repairs are required on a farm should be reviewed, and the series of related safety points should be discussed with the students to make sure they understand how to conduct themselves on the job.

Practical experiences both in the school and on the job should be a major focus of courses offered at the basic level. Students who are

concentrating their studies in the farm equipment service area should acquire as much on-the-job experience as possible. Their in-school work should be closely associated with the tasks they are assigned in the field. For this reason, close liaison should be maintained between the teacher and the personnel who are working with the students in the field.

It is important to make students aware of the wide range of occupations in this field. Guest speakers and trips to agricultural machinery manufacturers will provide students with an excellent overview of the career opportunities available.

Suggestions outlined for courses at the general level (following section) can be adapted to basic level courses. As well, adaptations can be designed for some of the suggestions outlined for Intermediate Division courses in this subject.

The evaluation process at the basic level should be heavily weighted towards the student's achievement in the practical work. Approximately 70 per cent of the term mark should be based on this component. Written tests should be short, and the number of topics covered in any given test should be limited. Frequent oral testing is an excellent way of assessing progress.

General Level

Course codes assigned to general level courses planned under this section will be TAG3G for Grade 11 and TAG4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop a healthy attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- practise problem-solving techniques by identifying needs and searching for logical solutions;
- learn to work independently on assigned tasks, assume leadership roles by assisting others, and communicate effectively with customers and fellow workers;
- acquire the skill and knowledge necessary to perform simple service and repair tasks on agricultural equipment;

- develop skills in the use of hand and power tools, maintenance equipment, and measuring instruments employed in the servicing of agricultural equipment;
- develop knowledge of the basic diagnostic equipment and how it is used;
- acquire knowledge and understanding of the functions and general operation of the various systems that make up agricultural equipment;
- acquire an understanding of the scientific principles related to the various systems and an appreciation of the associated technology;
- develop an understanding of the requirements of good customer relations and the fundamentals of proper business practice;
- acquire a perspective on the motive-power and agricultural equipment industries and knowledge of the various career opportunities within them.

Suggestions for Teachers

The course objectives planned by the teacher to allow students to accomplish the core learning may be supported by additional topics selected from units 6, 8, 11, 12, 16, and 22, which are listed at the end of this module under "Course Content for the Transportation

Grouping". Additional topics from these units may also be used to enhance major themes that may be used as teaching strategies. All content topics should be studied at progressively greater depth and breadth in successive courses in the program.

Safety considerations should be of primary importance for students enrolled in any course in agricultural equipment servicing. The development of safe work habits and attitudes by all student workers is essential if a safe and healthy work environment is to be assured. Special safety procedures relating to specific components, operations, and situations should be introduced when the appropriate circumstances arise and reviewed when the circumstances recur.

The topics in agricultural equipment servicing are diverse. The depth to which each topic is studied depends on both the theme selected and the level of difficulty of the course. A farm equipment mechanic theme, for example, focusing on the performance objectives outlined in the basic courses of the training profile for farm equipment mechanic (published by the Ministry of Colleges and Universities), is most appropriate for students who are planning to enter the trade as apprentices and who are taking the course at the general level of difficulty. While the performance criteria outlined in the training profile provide a standard for the evaluation of this learning, only a limited number of topics may be treated in the course time available. A theme of farm machinery servicing aimed at the broader needs of a farm equipment operator or a farm equipment dealer can be more comprehensive in its treatment of the subject content and can be offered at both levels of difficulty. Many of the topics included under a broad theme of this type may be merely exploratory. Topics related to the business aspects of the subject, such as financing of machinery purchases, the nature of warranties on equipment, reading and ordering from parts catalogues, and methods for inventory control, may be included. Studies related to hydraulic systems, diesel engines, and welding may also be included in an exploratory way or made available to students through supplementary courses.

Technical literacy courses should be planned to serve the needs of students who have chosen agricultural equipment servicing as an area of general interest or who are considering a

career in some aspect of agriculture. The majority of students probably fall into one of these categories. Technical literacy courses should provide a survey of the subject field with less emphasis on specific skills development.

Suggestions and comments outlined in the preceding section for the basic level and in the sections for Intermediate Division courses in this subject can be reviewed and adapted to courses planned for the general level.

The following ideas are offered for consideration by the teacher as ways in which classroom activities can be enriched:

- Co-operative education and regular work experience can include work periods not only in service shops and industry, but on farms as well.
- A 4-H tractor club can be initiated or sponsored by agricultural equipment servicing students and teachers.
- The International Ploughing Match and the Canada Farm Show are excellent for field trips.
- In many communities, the Farm Safety Association has representatives who are willing to come as guest speakers, show films and slides, and hold workshops on rural safety.
- Arrangements can sometimes be made to borrow pieces of agricultural equipment from dealers or local farmers for a short period during the off-season.
- Excellent manuals on various aspects of agricultural equipment servicing are available from manufacturers (facility in the use of these is essential to the continuing education of both students and teachers of this subject).
- The Farm Machinery Board and the University of Guelph can provide resources and advice.
- Fall fairs provide an excellent opportunity to exhibit projects and promote public relations.
- Tractor-pulls are an attraction that few students can resist.

- Timely stories in the media may be related to the course content.
- Open-house activities at school should be used for informative, promotional exhibits so that parent-taxpayers can see what is happening in your courses.
- Specific appeals to parents and neighbours for various resources will often produce useful materials.

Agricultural committees and advisory groups have identified a wide range of areas in which the farmer, in order to be successful, must have knowledge and skills:

- agricultural shop work: woodwork and carpentry, painting and glazing, rope work, harness work, sheet metal work, forge work, welding;
- agricultural power and machinery: transmission of power, farm engines, trucks and tractors, farm machinery;

- agricultural buildings and conveniences: concrete work, farm buildings, farm and house conveniences, heating and cooling;
- rural electrification: sources, terms, materials, farmstead and equipment maintenance;
- processing of agricultural products: refrigeration, processing, modifying.

Examination of the preceding list suggests that numerous related experiences could be provided in the school setting, particularly through co-ordination with other subject areas.

The learning, in both theory and skill development, acquired during practical activities should receive recognition in the evaluation of student achievement. The criteria for assessing achievement on all assignments should be established in advance. It is important that students understand these criteria before they begin any assignment.

Summary of Core Content for Courses in the Transportation Grouping

Chart 1.1.8

Content Units	Automotive Mechanics (Grades 9-10)		Auto Body Repair (Grades 9-10)		Small Engines (Grades 9-10)		Service Station Attendant (Grades 9-10) (Grades 11-12)		Agricultural Equipment Servicing (Grades 9-10) (Grades 11-12)			
	Basic	Gen/Adv	Basic	Gen	Basic	Gen	Basic	Basic	Basic	Gen	Basic	Gen
1. Safety	a	a	a	a	a	a	a	ab	a	a	a	a
2. The motor vehicle	a	a					a	a				
3. The engine	a	ab			ac	ad		ab	a	ab	ab	ab
4. Other power plants												
5. Transmission systems		a						a				
6. Wheels and tires	a	ab					a	a				
7. Steering systems and front axle		a						a				
8. Electrical systems	a	ab										
9. Fuel systems	a	ab										
10. Ignition systems	a	ab						a				
11. Lubrication systems	a	a					a	a				
12. Cooling systems	a	ab					a	a				
13. Braking systems	a	a										
14. Tools and equipment	abcd	abcd	ade	ade	ab	ab	abcd	abcd	abcd	abcd	abcde	abcde
15. Customer relations and business procedures			a	ab			a	ab				
16. Parts-department practice							a	a				
17. Automotive maintenance	a	ac					ab	abc	a	a	ac	ac
18. Owning an automobile							a	a				
19. Careers in the transportation industry	ac	abc	a	ab	a	ab	ac	ac	ad	abd	ad	abd
20. Applied science		a		c		a				ab	a	abc
21. Metal working for auto body repair			a	ab								
22. Welding for automotive repair			a	ab				a				
23. Auto body construction and trim			a	ab								
24. Glass installation												
25. Fibreglass repair												
26. Preparation for refinishing			a	a								
27. Painting			a	ab								

Content Units

Content Units	Automotive Mechanics (Grades 9-10)				Auto Body Repair (Grades 9-10)		Small Engines (Grades 9-10)		Service Station Attendant (Grades 9-10) (Grades 11-12)		Agricultural Equipment Servicing (Grades 9-10) (Grades 11-12)					
	Basic		Gen/Adv		Basic		Gen		Basic		Basic		Basic		Gen	
28. Small engines – trouble-shooting and repair							a	ab			a					
29. Small engines – systems							a	abc								
30. Farm tractors – power trains and control systems															a	ab
31. Farm machinery													a	ab	ab	ab
32. Estimating and farm equipment shop management																a
33. Soils, crops, and water management																a

See "Course Content for the Transportation Grouping", beginning on page 38, for description of the subunits a, b, c, etc.

Course Content for the Transportation Grouping

1. Safety	<ul style="list-style-type: none">a) Accident prevention in the shop or work-place; good housekeeping; control, storage, and handling of flammable fluids; compressed air; precautions in the handling of acids and other liquids; hazards of exhaust fumes, and control through proper shop ventilation; fire control – fire extinguishers; safe operation of electrical equipment; personal safety (clothing, goggles, masks, work procedures); safety rules for the use of safety guards, jacks, grinders, etc.;b) careful driving procedure when moving vehicles in and out of the shop; safe operation of floor hoists.
2. The motor vehicle	<ul style="list-style-type: none">a) Identification, location, and purpose of all major body and chassis systems and components and the interrelations among these systems and components.
3. The engine	<ul style="list-style-type: none">a) Engine design and construction; identification, purpose, and location of the engine parts; simple engine terms; principles of engine operation;b) engine auxiliary systems – parts, purposes, and operation; single- and multicylinder engines;c) four-stroke cycle single cylinder engines;d) two- and four-stroke cycle single cylinder engines.
4. Other power plants	<ul style="list-style-type: none">a) Operating principles and basic construction – gas turbines, rotary engines, rocket engines, steam engines, jet engines; comparisons for adaptability.
5. Transmission systems	<ul style="list-style-type: none">a) Identification, types, and purposes of clutch, gears, drive shafts, universal joints, rear axle assemblies; differentials;b) hydraulic, pneumatic, and power takeoffs; torque converters and fluid couplers; front-drive-shaft assemblies; standard transmissions; basic construction of main units; gear ratios.
6. Wheels and tires	<ul style="list-style-type: none">a) Types and sizes of rims and wheels; construction of tires, wheels, and hubs; mounting and inflating tires; load rating;b) cause of tire wear; wheel balancing; repairs to tires.
7. Steering systems and front axle	<ul style="list-style-type: none">a) Types and purpose of steering systems;b) methods of aligning wheels; types of front ends; types of joints; basic construction and operation of front ends; elements of front wheel alignment.

8. Electrical systems	<ul style="list-style-type: none">a) Introduction to simple electrical circuits;b) names, parts, and purposes of starting, charging, and lighting systems; simple electrical repairs;c) introduction to basic wiring diagrams.
9. Fuel systems	<ul style="list-style-type: none">a) Basic operation of fuel pumps and methods of fuel supply; carburetor principles; air filter types and operation;b) classification and operation of circuits; intake and exhaust manifolds; emission control.
10. Ignition systems	<ul style="list-style-type: none">a) Basic construction and function of main components;b) contact control, solid-state ignition;c) mechanical and vacuum advance units; magneto; importance of timing.
11. Lubrication systems	<ul style="list-style-type: none">a) Types and uses of lubricants and additives; chassis lubrication; oil pumps and filters; crankcase ventilation; SAE and API classifications of lubricants.
12. Cooling systems	<ul style="list-style-type: none">a) Water-cooling system; basic construction and operation of major units;b) thermostats; radiators and radiator cores; thermo-syphon system principle; importance of pressurized system.
13. Braking systems	<ul style="list-style-type: none">a) Hydraulic and parking brake systems; parts, location, purpose, and basic operation.
14. Tools and equipment	<ul style="list-style-type: none">a) Identification, care, and proper use of appropriate hand and power tools, air gauges, and hoses;b) battery testing and charging equipment; hand lubrication equipment;c) power lubrication equipment;d) floor jacks, hoists, and safety stands;e) welding equipment.
15. Customer relations and business procedures	<ul style="list-style-type: none">a) The importance of being careful with a customer's automobile; pride in the quality of one's work; co-operation with fellow workers and supervisors;b) dealing with complaints; estimating cost of repairs.
16. Parts-department practice	<ul style="list-style-type: none">a) Ordering procedures; stock-control systems; trade discounts; warranty procedures; preparation of invoices; handling of cash and credit transactions.

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| 17. Automotive maintenance | <ul style="list-style-type: none">a) Lubrication of engine, chassis, transmission, differential, and body; engine oil change and filter replacement; visual inspection of engine-ventilation systems and exhaust system; checking levels of liquids in battery, engine, and radiator;b) washing and waxing vehicles;c) inspecting emission controls; testing levels of liquid in the power-delivery train; making minor adjustments to auxiliary systems. |
| 18. Owning an automobile | <ul style="list-style-type: none">a) Licensing procedures; automobile insurance; purchase credit costs; vehicle owner and operator liability; cost of operation and maintenance; selling a used car. |
| 19. Careers in the transportation industry | <ul style="list-style-type: none">a) Understanding the trade requirements for becoming a qualified mechanic; opportunities within the field; apprenticeship training;b) available postsecondary education;c) limits of service station work without a mechanic's licence;d) occupations in the agricultural equipment servicing industry. |
| 20. Applied science | <ul style="list-style-type: none">a) Basic properties of solids, liquids, and gases; properties and characteristics of metals; characteristics of pressure and force, work and power; principles of machines such as the lever, wheel and axle, gears and gear trains; characteristics of automotive fuels and lubricants;b) application of Bernoulli's principle to fluid flow in pipes and to air foils; vacuum controls; centre of gravity;c) heat and energy; application of Pascal's law to static fluids in enclosed hydraulic systems. |
| 21. Metal working for auto body repair | <ul style="list-style-type: none">a) Dressing damaged areas; riveting; plastic and fibreglass; plastic or cold metal filling; removing minor dents from a panel; detecting high and low spots; sequence of procedures in repair; simple panel making;b) roughing out and alignment (doors, fenders, heads, trunk decks, windows, rear door openings, sun roofs). |
| 22. Welding for automotive repair | <ul style="list-style-type: none">a) Classes of metals; oxyacetylene welding; proper use of the torch; running a bead; brazing and cutting; spot-welding;b) the arc-welding process; metal shrinking;c) MIG welding; high-tensile steel welding. |
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23. Auto body construction and trim	<ul style="list-style-type: none"> a) Types of auto body and frame construction; b) vehicle design characteristics; identification of, and terms (technical and trade) for, body parts; c) fitting and adjusting minor body parts; fasteners; door construction, door interior, and car interior; hardwood and trim; seat construction and seat track mechanism; exterior moulding.
24. Glass installation	<ul style="list-style-type: none"> a) Types of glass; legal requirements; safe storage and handling procedures; removing, replacing, and fitting automotive glass; correcting misalignments of auto glass; installing mouldings; inspecting for and correcting leaks.
25. Fibreglass repair	<ul style="list-style-type: none"> a) Sandblasting to clean damaged areas; selecting proper fibreglass; patching (preparing resin and applying a patch); applying fibreglass filler; finishing; customizing vehicles.
26. Preparation for refinishing	<ul style="list-style-type: none"> a) Preparation of all metal surfaces – removing wax and silicone, sanding, masking, priming, spot puttying, washing, and removing dust.
27. Painting	<ul style="list-style-type: none"> a) Solvents – reducing paints for spraying primer surfacers; b) using lacquer, acrylic enamel, synthetic enamel, clear coat; c) spray gun operation and techniques; correct air pressure; d) introduction to spray booth – air make-up, exhausting of paint fumes, filtering devices; sequence painting of a vehicle.
28. Small engines – trouble-shooting and repair	<ul style="list-style-type: none"> a) Basic diagnostic techniques (visual), disassembly, inspection repairs, parts replacement, adjustments, cleanliness, reassembly; torque procedures; b) using manufacturers' specifications.
29. Small engines – systems	<ul style="list-style-type: none"> a) Basic theory of operation, repair – ignition (magneto), fuel (basic carburetors); b) diagnosing problems; c) operating principles and repair or replacement of components – tanks, filters, pumps, starting systems (manual, recoil), cooling systems; lubrication systems; d) electrical starting systems.

30. Farm tractors – power trains and control systems	<ul style="list-style-type: none">a) Inspection and servicing procedures; fundamental principles of tractor components such as belts, sheaves, chains, sprockets, gears, flywheel clutch assemblies, manual shift transmissions, drive shafts, universal joints, power takeoff shafts and shields;b) steering systems, differentials, brake systems, final drives.
31. Farm machinery	<ul style="list-style-type: none">a) Basic operating principles, set-up procedures, storage procedures, and preventive maintenance for common types of tillage, planting, spraying, fertilizing, harvesting, and materials-handling equipment; pre-delivery inspections; routine servicing and periodic maintenance criteria; manufacturers' manuals; adjustments and checks;b) repair and overhaul procedures for simple components.
32. Estimating and farm equipment shop management	<ul style="list-style-type: none">a) Economic principles applied to repair procedures – estimating labour, materials, and overhead (typical estimating techniques); parts ordering, stock procedures, inventory control; shop organization; quality control (awareness of manufacturing methods, acceptable standards); good public relations (employee attitude and responsibility, warranties, handling customer complaints, courteous communication).
33. Soils, crops, and water management	<ul style="list-style-type: none">a) General nature of soils; changes due to cultivation; relationships between water, soils, and plants; organic matter, fertilizer mixtures, and programs for various crops; soil management – heavy-, light-, and medium-texture soils; soil conservation and erosion; farm planning; Ontario basic grain and forage crops – principles and practices, local applications; types of crops – their classifications, importance, adaptation, and rotation; climatic factors locally and/or in southern Ontario; growing season, crop distribution, and varieties; tillage and seeding methods; weed control; harvesting techniques.

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
4. Food Services Grouping	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
5. Graphics Grouping	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
5. Graphics Grouping	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
5. Graphics Grouping	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Automotive Mechanics (Grades 9-12)

Auto Body Repair (Grades 9-12)

Small Engines (Grades 9-12)

Service Station Attendant (Grades 9-12)

Agricultural Equipment Servicing (Grades 9-12)

Curriculum Guideline

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*2. Construction
Grouping*

Module 1, 1986



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Introduction to the Construction Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, *Part B*, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. *Part A* provides essential background for the planning of all courses in technological studies. The following three sections in *Part A* are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of *Part B* are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in *Part B* is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the construction grouping. The grouping includes seven subjects: woodwork; masonry and trowel trades; heating, refrigeration, and air conditioning; plumbing and pipefitting; building and equipment maintenance; custodial services; and painting and decorating.

Students may enrol in courses derived from this document for a variety of reasons. For most students, the courses will be their initial introduction to the occupational areas within the construction grouping. For some, enrolment will be the first step towards an apprenticeship as a plumber. For others, it will be an introduction to other occupations related to the industry, such as carpenter or painter. For many, it will lead to postsecondary studies. While each of the seven subjects outlined in this document deals with unique content, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses in any of these seven subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic, general, and/or advanced level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined as core content for each

section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific learning objectives, which shall be based on the aims for courses at the basic, general, and advanced levels. The nature of the core aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Construction Grouping", at the end of this module, or from the course content listed at the end of any other module in *Part B*.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the construction grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Construction Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 2.1.12 provides a summary of the core content for all courses in the construction grouping. This summary chart serves as a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Construction Grouping". Topics appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the general horticulture section in the horticulture component may be incorporated into the masonry and trowel trades program if construction of a masonry flower box is an appropriate project for a particular theme.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in construction, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 woodwork, general and advanced levels) or at different grade levels (e.g., custodial services, Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students acquire skills, they are motivated to acquire related knowledge and develop desirable attitudes and understanding. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is building a brick wall or producing a woodworking project. Significant aspects of the completed product or service are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in construction courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's achievement on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained from these experiences is particularly important to today's young people, who face a working life characterized by changing technology and the need to continually update their skills and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should have opportunities to become aware of the various tasks that computer technology performs in the construction industry. Visits to construction engineering establishments, mechanical contracting firms, and institutional training centres related to the industry can provide insights into the use of computer technology in accessing, recording, and processing information. Students should observe computer assistance in such activities as drafting, estimating the cost of projects, accessing sources of supply, controlling inventory, scheduling operations, and communicating.

Woodwork

Intermediate Division

(Grades 9 and 10)

Students may enrol in woodwork courses for a variety of reasons. Most of those who enrol want to acquire knowledge about woodwork or carpentry (building construction) and such skills as the safe and effective use of hand and power tools. Many study woodworking as a means to career goals; others want to put woodworking to personal use, in home maintenance or leisure activities.

For students who leave school prior to graduation, the skills learned in a wood shop may be sufficient preparation for a job on a construction site or in a plant that produces wood products. Many of the skills and work habits acquired in a wood shop are transferable to other technical areas in industry and can be of some assistance to students seeking semi-skilled positions.

Students who continue with Senior Division courses in this subject field may plan on a program of postsecondary studies in a community college, a faculty of engineering, or a school of architecture. A wide range of challenging opportunities related to the construction field exists for students who graduate

from one of these postsecondary institutions. Some of the careers available to postsecondary graduates are estimator, construction technician or technologist, interior designer, civil engineer, and architect.

Courses in woodwork are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 2.1.1 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division woodwork courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, layout, woodworking trades materials, foundations, joining and fastening wood, and finishing.

Chart 2.1.1
Core Content for
Woodwork
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General / Advanced</i>
1. Introduction	ab	abde
2. Safety	abi	abi
3. Project management	a	abc
4. Layout	ab	abc
5. Woodworking trades materials	a	ab
8. Foundations	bce	bcde
9. Floor and ceiling construction	e	abcefh
10. Wall construction	c	acd
11. Roof construction	a	abf
12. Wall and ceiling finishing		g
13. Floor finishes		d
18. Insulating	a	ac
19. Truing rough lumber by hand	b	ab
20. Truing rough lumber by machine	ace	abcdef

Content Units	Core Content for Courses	
	Basic	General / Advanced
21. Special machines	a	a
22. Joining and fastening wood	b	abd
23. Finishing	a	ac

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCW1B for Grade 9 and TCW2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- select and use properly the hand and machine tools required to perform the layout, cutting, fitting, and assembly operations for a woodwork project;
- raise their confidence and self-esteem by successfully completing a woodwork project;
- develop the ability to follow instructions and express ideas clearly;
- protect the safety of the individual and the group by developing safe work habits;
- develop socially acceptable attitudes, including readiness to co-operate;
- learn to accept the decisions of the majority while respecting the rights and opinions of minorities;
- acquire respect for the dignity of honest labour and a sense of pride and achievement in a job well done;
- acquire knowledge of the employment opportunities and skill and training requirements for the various trades and specialized operations associated with woodwork and the construction industry.

Suggestions for Teachers

The content units for woodwork courses at the basic level in Grades 9 and 10 are identified in chart 2.1.1. The topics that constitute these units may be incorporated into the course in various ways to accomplish various objectives. For instance, although unit 1 ("Introduction") can be presented in its entirety at the beginning of the course, the topics are more meaningful if they are discussed informally whenever appropriate occasions arise.

In dealing with unit 2 ("Safety"), teachers should introduce safety rules related to specific operations, machines, and situations when the appropriate circumstances arise. The teacher must ensure that only students with the necessary maturity are allowed to operate powered equipment. General shop safety should be stressed from the beginning of a course. As the course proceeds, students

should gain an appreciation for the overall safety of the individual and the group and express it in safe work habits and attitudes. The importance of the Construction Safety Association and the Industrial Accident Prevention Association should be stressed. Safety films and posters produced by the accident prevention associations may be used to increase student awareness of safety.

Activities associated with unit 3(a) ("Project management") involve interpretation of simple plans for construction projects. Discussion should focus on how such plans are used to implement the projects and should introduce students to the concept of scheduling.

The topics in unit 5 ("Woodworking trades materials") should be incorporated into project activities whenever students are likely to

encounter problems related to wood structure (e.g., when they need to choose table leg material with no serious structural defects or to glue narrow stock to make a table top).

When planning basic level courses, teachers should select themes that further the program aims and help students learn the core content. The themes may relate to one of the three woodwork specialties of cabinetmaking, patternmaking, and carpentry or to some combination of them. In Grade 10 basic level courses, the theme may be job opportunities in the industry and may focus on local requirements. Employment conditions vary over time and from region to region. To keep in touch with current practices, teachers should maintain close contact with the industry through service clubs, trade magazines, field trips, and the study of particular areas of the wood construction industry on professional development days.

Themes can generally be structured most effectively around project work. Projects for Grade 9 basic level courses should be interesting, attractive, and simple enough to be completed by the average student in the allotted time. Students are often more interested if they can suggest projects and contribute design ideas. In general, a Grade 9 project should be one that the student can either use or recognize as useful from his or her youthful perspective. Typical woodwork projects in Grade 9 are rustic coffee or end tables, shelving units, stereo stands, speaker enclosures, and storage chests. If time is limited, a smaller project should be considered, such as a spice rack.

Grade 10 carpentry themes can include the design and construction of larger projects. Garden tool sheds, garages, and small sleeping cabins make excellent projects for small groups of students. Students should be encouraged to include the appearance of the structure in their planning. Models are useful, but full-size structures are more interesting and encourage student learning and involvement. Other projects related to commercial or industrial carpentry practices can also be used effectively. These projects should be designed to expose students to core content that was not presented in the Grade 9 course.

So that students may acquire experience on the job site, larger carpentry projects may be prefabricated in the shop and erected on the site. Field trips to various construction sites may also be timed to coincide with the type and stage of construction of the project being built in the shop.

In Grade 10, projects associated with cabinetmaking themes should reinforce and extend the core content covered in Grade 9 introductory courses. More difficult or comprehensive projects should be developed, with greater student involvement at the design stage. Teachers should set realistic limits on project designs while allowing enough freedom to ensure student interest in the completion of the project. To capture the interest of some students, projects could include the design and fabrication of games and sports equipment. Field trips to furniture manufacturing plants, furniture stores, and exhibitions can provide students with useful background information to support cabinetmaking themes.

Woodworking skills and knowledge are also applied in patternmaking, a woodwork specialty normally associated with manufacturing. Projects that relate to a patternmaking theme in Grade 10 must emphasize the basic concepts of patternmaking and foundry work. Optional topics can be selected from the manufacturing subject grouping. Every attempt should be made to illustrate the relationship and importance of the patternmaking process to the foundry and casting process as a whole. Students can learn about the moulding and casting processes of patternmaking by trying them out. Projects can include fabricating precast concrete forms or producing interesting moulds that can be poured to produce plaster-of-Paris objects. The objects can be incorporated in a display at the school and shown at an open house to enhance student pride and motivation.

In general, learning experiences planned for basic level courses should be closely connected to the real world. Abstract concepts and information taught in isolation or with little direct connection to the students' world outside the classroom are of little permanent value to most students enrolled in basic level courses.

For effective learning, skills and knowledge should be closely related to what the students require for completion of their current project

or theme activity and should be perceived by the student as having value in the world outside the classroom.

General Level

Course codes assigned to general level courses planned under this section will be TCW1G for Grade 9 and TCW2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- organize, schedule, and draw up a basic bill of materials for a simple woodwork project;
- select and use properly the hand and machine tools required to perform layout, cutting, fitting, and assembly operations on a project;
- identify and construct wood joints as required for a project and give reasons for the choice of each joint;
- analyse the needs of a project and choose all materials (including all joining and finishing materials) accordingly;
- complete a project in one of the following woodwork specialty areas: carpentry, cabinetmaking, or patternmaking;

- understand the role of woodworking courses as means of achieving short- and long-term personal goals;
- develop a sense of pride in acquiring a broad range of technical skills and knowledge applicable in the labour market;
- accept personal responsibility as a member of the course relative to work habits, care of equipment, economical use of materials, and respect for the achievement of others;
- protect the safety of the individual and the group by developing safe work habits;
- acquire knowledge of the employment opportunities and training and entry requirements for the occupations associated with woodwork and the construction industry in general.

Suggestions for Teachers

Teachers planning courses at the general level of difficulty should review the suggestions for teachers outlined in the preceding section for the basic level. In courses planned for the general level of difficulty, students can be expected to incorporate theoretical concepts of woodworking into their practical assignments. In assessing student progress at this level of difficulty, it is important that the practical aspect of the student's work be emphasized. Approximately 60 to 70 per cent of the student's final mark should be based on practical assignments, such as projects.

It is important that students understand the conceptual content of unit 19. Familiarity with the parts of hand tools is not as important as skill in the use of the tools.

Safety is of prime importance in learning experiences related to the use of machines. By starting the students off with safe techniques, teachers can avoid the need to constantly emphasize "don'ts". Students will then learn the safe way and will not be tempted to try something just because the teacher said not to. Memorization of parts and of safety rules that do not relate to the operation being performed should be minimized.

Finished models or projects that incorporate individual wood joints or fasteners are useful items that can be used to generate interest in and discussion of various methods of joining and fastening woods.

Teacher demonstrations of activities will convey the information in the most meaningful way. Remedial work may be guided by videotapes, slide presentations, or information sheets.

All the core units in woodworking are related to three specialty subjects: carpentry, cabinetmaking, and patternmaking. First-year courses will probably be very similar to one another except for the optional units and topics chosen by each teacher. The optional content will vary according to the theme(s) it must enhance.

Second-year courses can support the core content by using themes related to the specialty of carpentry, cabinetmaking, or patternmaking. The optional content in such cases should be chosen to support both the core content and the subject specialty for which the course is designed.

A carefully chosen course theme can help students to achieve the program's aims and to learn the core content. Since the program's objectives are to be achieved by the end of the Intermediate Division, the themes can be designed either to offer specialization in one of the three subject areas or to integrate the areas.

Major projects can serve as useful themes for courses in any of the woodwork subjects. Interesting and attractive teacher-designed projects can be selected for Grade 9 courses. Teachers can enhance students' interest by soliciting their project suggestions and design ideas. Every project should be designed to incorporate some or all of the core content. Optional topics, if necessary to complete the project, may be selected from the course content for the construction grouping (listed at the end of this module). The optional knowledge and skill topics in any course should be chosen to fit the theme. Extra topics that do not relate to the theme should be discarded or used with a new theme. In all cases, the

projects selected for a course must reflect both the level of difficulty and the grade at which the course is offered.

Carpentry themes. Grade 10 themes can include the design and construction of larger projects. Garden tool sheds or small sleeping cabins make excellent projects for small groups of students, especially if some imaginative design ideas are used to enhance the appearance of the structures. Models are useful, but full-size structures are more interesting and encourage student learning and involvement. Projects related to commercial or industrial carpentry practices can also be used effectively. These projects should be designed to expose students to core content that was not presented in the Grade 9 course.

Cabinetmaking themes. Cabinetmaking courses in Grade 10 should involve projects that require a higher level of knowledge and skill development than do Grade 9 introductory courses. More difficult or comprehensive project designs should be developed, with greater student involvement at the design stage. Teachers should set realistic limits on project designs while allowing enough freedom to ensure student interest in the completion of the project.

Patternmaking themes. Although woodwork courses normally lead to trades in the construction industry, woodworking skills and knowledge can be applied to patternmaking, a specialty that is normally identified with manufacturing. Second-year patternmaking projects must emphasize the basic concepts of patternmaking and foundry work. Optional topics can be selected from the manufacturing subject grouping. Every attempt should be made to illustrate the relationship and importance of the patternmaking process to the total foundry and casting process. Students can learn about the moulding and casting processes of patternmaking by completing projects that involve these processes.

Advanced Level

Course codes assigned to advanced level courses will be TCW1A for Grade 9 and TCW2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- design and execute a woodworking project requiring a variety of machining and hand-tool skills;
- interpret the blueprint of a wood product in order to prepare the list of required materials and their estimated costs;
- acquire general knowledge about a variety of soft and hard woods;
- develop skills in the safe and efficient use of a wide variety of common and specialized hand and power tools;

- relate mathematical and scientific principles to the technology of the woodworking field;
- acquire and improve skills in researching and communicating technological ideas and information through written reports and oral presentations;
- acquire an overview of the occupations and opportunities for further training in woodworking and related fields.

Suggestions for Teachers

The core content for courses in woodworking at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 2.1.1. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. In addition to the core content indicated in chart 2.1.1 for general/advanced level courses, the following topics should be included in courses for the advanced level: 1(f)(g) ("Introduction"), 5(c)(d) ("Woodworking trades materials"), 8(a)(h) ("Foundations"), 9(g) ("Floor and ceiling construction"), 10(g) ("Wall construction"), 11(c)(e) ("Roof construction"), 13(e) ("Floor finishes"), 18(b) ("Insulating"), 22(c) ("Joining and fastening wood").

Courses should focus on design considerations and problem-solving tasks more than general level courses normally do. This difference in focus should be reflected in the objectives for the course.

Where time permits, optional content may be selected from other subjects within the construction grouping or from related subjects, such as architectural drafting or design studies, in other groupings. Any optional content should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of the topics as independent study, particularly in bi-level courses, where the advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various woodworking topics must be included in the course.

Woodwork

Senior Division

(Grades 11 and 12)

Woodworking courses for the Senior Division may be offered in one or more of three specialty areas: construction technology, carpentry, and industrial woodwork.

Construction technology. Courses in this subject area may be offered in Senior Division at basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the curriculum guideline *Elements of Construction Technology, Senior Division, 1969* and the supplement to this guideline, published in 1970. The courses will provide an overview of the building construction industry as well as skill and knowledge associated with the carpentry trade. Students taking these courses will be prepared for further training in postsecondary institutions and in the building construction industry. The courses may vary in time allotment and may offer credit for up to 330 hours of in-school work each year. The course code for courses in this subject area will have the letters TCY as its stem.

Carpentry. Courses in this area of specialization may be offered in Senior Division at the basic and general levels of difficulty. Planning for these courses will continue to be based on the curriculum guideline *Elements of Construction Technology, Senior Division, 1969*. These courses should build on the skill and knowledge introduced through carpentry themes in the Intermediate Division and thereby facilitate students' entry into this trade. Topics from the list of content at the end of this module or from any other related grouping in technological studies may be included in these courses as required. Wherever possible, work experience and co-operative education programs should be planned to augment these courses. Carpentry courses may be designed for varying time allocations and may offer credit for up to 330 hours of in-school work each year. The course code for courses in this subject area will have the letters TCC as its stem.

Industrial woodwork. Courses in this subject area may be offered in Senior Division at basic and general levels of difficulty. Planning for these courses will be based on the curriculum guidelines *Elements of Construction Technology, Senior Division, 1969* and *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963: Woodworking – Pattern and Casting Processes*. These courses may build on themes associated with cabinetmaking, millwork, and patternmaking – themes introduced as part of Grade 10 courses in the Intermediate Division. Topics from the list of content at the end of this module or from any related grouping in technological studies may be included in these courses as required. Themes associated with the occupation of industrial woodworker may also be planned for Senior Division courses; terminal performance objectives outlined for the basic apprenticeship course in the training profile *Industrial Woodworker* (published by the Ministry of Skills Development) may be included in course planning as required. Industrial woodwork courses may be designed for varying time allocations and may offer credit for up to 330 hours of in-school work each year in Grades 11 and 12. The course code for courses in this subject area will have the letters TML as its stem.

Work experience and co-operative education are two important aspects of a woodwork course that should be considered when students have acquired sufficient skills and knowledge to feel comfortable in an industrial or construction setting. Many of the fundamentals developed in a wood shop acquire new significance when students see them applied on the job. Working with adults, working in outdoor conditions, having to be punctual and to maintain good attendance, having to co-operate with fellow workers and accept supervision – all are valuable learning experiences available in the world of work.

Masonry and Trowel Trades

Intermediate Division

(Grades 9 and 10)

Courses in masonry and trowel trades introduce students to the basic skills and knowledge necessary to lay bricks, blocks, and possibly stone, set tile, and create simple concrete shapes. The knowledge and skills gained from courses planned from this section will assist students in a variety of ways. For some students, the courses will provide general insight into a trade area that they may wish to study at greater depth in Grades 11 and 12, with the intention of eventually entering an apprenticeship. For other students, the courses will develop skills and knowledge that they will put to personal use.

Courses in masonry and trowel trades are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 2.1.2 identifies the core content for these levels.

The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, layout, trowel trades materials and processes, concrete construction, and basic brick- and block-laying.

Chart 2.1.2
Core Content for
Masonry and Trowel
Trades
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	abde	abdefh
2. Safety	abcij	abcij
3. Project management	ab	cde
4. Layout	b	abe
6. Trowel trades materials and processes	a	abc
10. Wall construction	e	e
12. Wall and ceiling finishing	c	c
16. Concrete construction	a	a
17. Basic brick- and blocklaying	a	a

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCT1B for Grade 9 and TCT2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop efficient communication skills, both written and oral, with emphasis on language associated with the trowel trades;
- develop the confidence and ability to attempt a new task;
- develop respect for others and a co-operative attitude towards peers and instructors/supervisors;
- develop responsible work habits and a positive attitude towards safety;
- develop the manual dexterity necessary in the masonry trades;
- develop a sense of pride in a job well done;
- develop a willingness to assume responsibility;
- acquire a positive attitude towards punctuality;
- develop familiarity with the basic tools and equipment of the masonry trades;
- practise the basic skills associated with the masonry trades;
- acquire knowledge of the various occupations related to the trowel trades.

Suggestions for Teachers

The spreading of mortar should be given special emphasis in courses based on this section. Knowing that they can spread mortar properly and can complete small, simple projects will encourage students to continue.

Because of the varied abilities of basic level students, there must be some flexibility in the evaluation process. In some cases, the practical mark may constitute 50 to 60 per cent of the final mark. The projects at this level must serve two purposes. First, they must develop skills progressively, and second, they must arouse the students' interests by being fun. An excellent example is building a brick column in a soldier position. This type of project may be carried out as a competition, in which the student who uses the most bricks is the winner. The value of such a project is that it emphasizes the need to keep projects plumb.

The development of life skills is an important aspect of basic level courses. Every opportunity should be taken to discuss real-life situations that concern students. Student questions may not come up at opportune times but nevertheless should be answered spontaneously and sincerely.

The instructor should regularly demonstrate, both to the class and to individual students, the appropriate manipulative skills for specific trowel trade tasks. A demonstration is often the most successful way to instruct students. It not only allows students to see how an operation should be performed but also serves as an inspiration to develop the skills necessary to perform a given task. Students studying at the basic level of difficulty often lack the ability to follow verbal instructions, but having seen a demonstration, they understand what is required and are quite capable of executing the task.

Safety is of prime importance in the field of construction. It is essential that students develop a positive attitude towards safe work habits. Excellent posters, films, and literature are available from the Construction Safety Association upon request. Representatives of the association are also prepared to come to a school to discuss construction safety with both the teacher and the students.

Teachers should feel free to select additional topics from the course content at the end of this module if students become involved in projects or themes that go beyond the core content. Programs should be designed to provide flexibility for coping with a wide variety of student skills, abilities, and interests.

Pride in one's work should be nurtured in students early in the program. All too often at

the basic level, students are reluctant to lag behind their peers in completing projects. As a result, they may concern themselves more with timetables than with the quality of their work. The flexibility must exist to allow extra time if students need it.

Field trips and guest speakers may be used to introduce career discussions, particularly in Grade 10.

General Level

Course codes assigned to general level courses planned under this section will be TCT1G for Grade 9 and TCT2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop efficient communication skills, both written and oral, with emphasis on terminology associated with the trowel trades;
- develop a sense of pride in completing a task in an orderly and competent fashion;
- develop respect for others and a co-operative attitude towards peers and instructors/supervisors;
- appreciate the importance of safe work habits and procedures;
- develop dexterity in the use of hand tools and equipment involved in the masonry trades;

- develop the ability to use a spirit level properly;
- acquire general knowledge of the various occupations associated with the masonry and trowel trades;
- become familiar with the terms *plumb*, *level*, and *straight*;
- develop some leadership qualities;
- learn to accept critical evaluation;
- learn to work on and complete a project independently;
- develop time management and organizational skills in completing project work.

Suggestions for Teachers

Teachers planning courses at this level of difficulty should refer to the comments about skill development outlined in the preceding section for basic level courses. The basic skills and knowledge identified with the tasks are the same for both levels of difficulty. Students studying at the general level of difficulty may be expected to develop these basic skills in a little less time, but if their courses are shorter, their level of skill development will be about the same. General level programs should involve more theoretical material, and students may be expected to work on more

complex projects. This does not mean that the theoretical aspect should become the dominant feature of the program. Students studying at this level of difficulty prefer a practical orientation. Because the repetitive aspect of skill development can become very tedious for students, teachers should attempt to develop skills through imaginative projects that will hold the students' interest. The more realistic the project, the easier it is to maintain a high level of interest. Challenging projects that require several class periods to complete make students eager to return to class.

Students studying at this level of difficulty will often be limited in their ability to read and write. It is important for teachers to recognize these limitations and to act accordingly when preparing instructional material or setting tests and exams for assessment purposes. The evaluation of student achievement should be weighted towards the practical aspect of the program. Brief oral tests, administered individually, and observation of students' performance on practical work assignments are often the most accurate measures of students' progress. Students should be given assignments that involve written material in order to improve communication skills. These assignments should be introduced gradually and should incorporate terminology associated with the masonry trade.

Students at the Intermediate level often enrol in technology courses with the intention of eventually entering one of the trades or a semiskilled occupation. It is important, therefore, to discuss the various career opportunities in the masonry trade. Bringing in a recent graduate who is employed in the trade or a young person who has just finished an apprenticeship gives students an ideal opportunity to discuss the pros and cons of the trade.

Young people tend to see themselves as employees, not employers, so it should be pointed out to them that once they have received their training, through apprenticeship or by some other route, it is possible to start up their own businesses. Bringing in a successful stonemason or tilesetter to talk to students about self-employment as a tradesperson can be worthwhile for students, whether they continue their training in masonry and trowel trades or in some other field.

In order to keep the students and the instructor as up to date as possible, it is an excellent practice to invite well-qualified tradespeople into the shop to evaluate the physical layout and the program. Such constant evaluation is effective not only in keeping the instructor up to date but also in providing reinforcement when physical changes are required to support the program.

Masonry and Trowel Trades

Senior Division

(Grades 11 and 12)

Senior Division courses in trowel trades introduce students to a wide variety of construction trades and make them familiar with occupational opportunities. Students taking these courses may begin to specialize in one or more of the following trade categories: brick- and blocklaying, stonemasonry, tilesetting, concrete technology, plastering, and drywall application and finishing.

Students may enrol in these courses to meet a variety of different needs. Students who successfully complete a program of courses based on this subject should have sufficient skills and knowledge to enter an apprenticeship upon graduation. Students who take architectural drafting or construction technology courses as related subjects may use their insights into these trades to continue with postsecondary

studies and/or enter the general contracting field. For many students, the knowledge and skills they acquire from courses based on this section will be put to personal rather than vocational use. The program should develop in all students good work habits and pride in their work.

Courses in masonry and trowel trades are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 2.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 2.1.3
Core Content for
Masonry and
Trowel Trades
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	abde	abdefh
2. Safety	abcij	abcij
3. Project management	a	ac
4. Layout	abe	abde
6. Trowel trades materials and processes	abcd	abcd
8. Foundations	abef	abef
9. Floor and ceiling construction	a	ach
10. Wall construction	ef	ef
12. Wall and ceiling finishing	acd	acd
13. Floor finishes	ab	abc
15. Chimneys, fireplaces, and barbecues	a	a
16. Concrete construction	ab	ab
17. Basic brick- and blocklaying	ab	ab
21. Special machines	b	b

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCT3B for Grade 11 and TCT4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- plan and complete a job in an orderly and competent fashion;
- acquire an overview of the masonry trade and the occupational opportunities within it;
- gain some practical experience on a building site through either a work experience program or a co-operative education program;
- learn to apply logical and sequential steps in solving a problem;
- design and build a masonry structure of a limited size;
- develop pride in good work;
- develop the ability to read a set of simple working drawings;
- acquire knowledge of the methods used in estimating materials and time schedules;
- learn to use the basic tools, machinery, and equipment of the masonry trade competently and safely;
- read articles in trade journals about new developments in the trade;
- develop the ability to communicate precisely and accurately on trade-related topics.

Suggestions for Teachers

Many students who enrol in these courses in Grades 11 and 12 are seriously thinking of entering one of the masonry trades. It is important, therefore, to do everything possible to inform students of the advantages and disadvantages of the various masonry and trowel trades. Field trips are often good sources of this type of information. However, an extended period on the job is probably the best way to learn exactly what it is like to work in a particular trade. A well-organized co-operative education component of a masonry trades program, giving students the opportunity to sample the various trades, may be the best way to facilitate this learning. In order for the co-operative program to provide a worthwhile learning experience for the student, several components of the program must be monitored. The instructor, in close co-operation with the employer, must ensure that the student's efforts lead to educational benefits. On the job site, the employer must provide close supervision of the student, critically appraising his or her efforts regularly.

While the student is on the co-operative program, he or she must be assured of the mutual reinforcement of the in-school and out-of-school components. Whether the student attends the out-of-school component one day a week or one period a day, the work situation

with the employer must be monitored, and the skill areas that need development must be reinforced during the in-school component.

The most marketable skills that a young person can possess when seeking employment are well-developed work habits. Tidiness, punctuality, politeness, trustworthiness, and eagerness to learn are characteristics that employers seek in a new employee. The teacher who possesses and displays these traits has a much better chance of developing them in students. A clean, tidy, well-organized shop sets a good example for students of an efficient and safe working environment.

It is often difficult to design masonry projects that are meaningful to students and have a degree of permanence. A structure or project should last at least long enough to be perceived as a finished product. Too frequently, students build walls that have been torn down by the time they are next in the shop. In many cases, this hasty destruction is perceived as the only way a teacher can handle the project activity for the number of classes with which he or she is involved. However, the teacher can circumvent this problem by using large theme projects that involve many students over an extended time. Such projects can be excellent vehicles for developing skills and testing

creative ideas. They also provide situations in which values-related skills such as co-operation, leadership, and group planning can be developed. In some cases, such projects can be planned to involve other technical and academic subject groups. There is always a

need for permanent masonry constructions within the school and the community. Students are very receptive to the idea of working on such projects. They realize that the results of their efforts will be on public display as a direct reflection of their abilities.

General Level

Course codes assigned to general level courses planned under this section will be TCT3G for Grade 11 and TCT4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to read architectural plans, estimate masonry costs, and develop lists of required masonry materials;
- develop the ability to work with others as either leader or member of a group;
- acquire creative skills in planning a masonry structure;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;

- acquire an overview of the masonry trade and the occupational opportunities that exist in it;
- design and build a small masonry structure;
- critically evaluate their own work and develop pride in its quality;
- understand basic theoretical concepts associated with the masonry trades;
- acquire practical experience through either a work experience or a co-operative education program.

Suggestions for Teachers

Teachers planning masonry trades courses for the general level of difficulty should review the suggestions outlined in the preceding section for basic level courses.

Senior Division students enrolled in general level courses in this subject should be given the opportunity to develop, in addition to the fundamental skills of the trades, some skills in designing, estimating, and drafting. Some of these students may eventually start up their own businesses; development of any related skills that could be supportive of such pursuits should also be considered when planning these courses.

Whenever possible, teachers in the masonry trades should attempt to discuss with the academic teachers methods of integrating their respective disciplines. Writing technical reports, making mathematical calculations, and

investigating some of the scientific principles involved in the masonry trades all reinforce students' learning in the various disciplines and increase the relevance of students' education.

As Senior Division students develop their skills and become more mature, opportunities for small construction projects within the community may be sought. A flower box or a patio wall may be designed by a group of students and eventually erected on the site. This type of project requires careful planning and a study of the various problems that might arise. Such a project can lead to a structure that students helped plan and build and that serves a permanent and useful purpose in the community. Successful projects of this type are a source of pride and satisfaction for both the students and the community.

Heating, Refrigeration, and Air Conditioning

Intermediate Division

(Grades 9 and 10)

Qualified tradespeople in heating, refrigeration, and air conditioning generally specialize in the machines and equipment related to one of these areas. Specialists, for example, can be refrigeration mechanics or heating specialists in oil, gas, or solar systems. In addition, there are many occupations that directly support these trades and require a comprehensive technical knowledge about these fields.

Students with aspirations to apprenticeship or further training in one of the occupations in this field will acquire from these courses some skill and knowledge in the three major areas. In addition to learning, through practical experiences, the nature of the work involved, they will acquire career information about further training programs, advancement possibilities, employment outlook, and working conditions. Students should be made aware that mathematics and physics provide important theoretical background for success in this field and that useful related subjects include mechanical drafting, blueprint reading, and electricity.

Intermediate Division courses in heating, refrigeration, and air conditioning, along with appropriate Senior Division courses, form a program that can lead to postsecondary training as a technician or technologist.

This postsecondary training can prepare students for related employment in the fields of production, systems design, installation, and maintenance. Technicians and technologists are often called on to help engineers design and prepare cost estimates for systems, to experimentally investigate new ways of using machines, and to supervise mechanics and work crews who perform installations.

Courses in heating, refrigeration, and air conditioning are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 2.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, layout, building services materials, the conditioning of air, refrigeration systems, and pipe and tubing materials.

Chart 2.1.4
Core Content for Heating, Refrigeration, and Air Conditioning Intermediate Division (Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General / Advanced
1. Introduction	abde	abdef
2. Safety	abdfgk	abdfgk
3. Project management	ad	abcd
4. Layout	b	b
7. Building services materials	b	b
18. Insulating	abce	abce
24. The conditioning of air	ac	abc
25. Heating and cooling calculations	a	ab
26. Refrigeration	a	ab

Content Units	Core Content for Courses	
	Basic	General / Advanced
27. Refrigeration systems	a	a
28. Charging a system		a
48. Pipe and tubing materials	a	a
49. Physics of heat		a
50. Fundamentals of electricity		a
51. Testing and measuring		a

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCH1B for Grade 9 and TCH2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop respect for and demonstrate the proper and safe use of hand and power tools, torches, chemicals, and refrigerants regularly used in the trade;
- select and use appropriate tools and fittings for cutting, reaming, flaring, swaging, bending, and joining copper tubing by soldering or brazing;
- learn how to solve problems associated with heating, refrigeration, and air conditioning systems;

- learn to use test equipment to make temperature, pressure, electrical, and linear measurements and to use the measured quantities in calculations;
- identify and state the function of various components of a refrigeration system;
- protect the safety of the individual and the group by developing safe work habits;
- develop a sense of pride in their accomplishments as they acquire basic trade skills and knowledge;
- develop knowledge of the employment opportunities and the training and entry requirements for the trades and other specialized occupations associated with heating, refrigeration, and air conditioning.

Suggestions for Teachers

The topics in unit 1 ("Introduction") can be effectively presented in informal discussions.

In dealing with unit 2 ("Safety"), teachers should introduce rules related to specific operations, equipment, and environmental situations when the appropriate circumstances arise. General shop safety and the responsibility of every student to maintain it should be discussed at the beginning of the course. Students should also be made aware of the roles of the Construction Safety Association and

the Industrial Accident Prevention Association in maintaining safety on the job. Objectives that will help the student develop safe work habits should be identified for each major learning activity planned for the course.

The content of units 24 ("The conditioning of air") and 27 ("Refrigeration systems") can be treated together in some instances. At the basic level, a simple explanation of the terms and the applications of the concepts is sufficient. In the Intermediate Division, students

need only be aware of the importance of proper system design and its relation to appropriate standards. No attempt should be made to teach the contents of written codes and standards in courses based on this section.

The content of unit 24 ("The conditioning of air") can also provide a curriculum vehicle for the aim related to the use of elementary test equipment, tools, and techniques. The tools include thermometers, pressure gauges, electrical meters, linear measuring devices, and the basic hand tools used regularly in the trades associated with this subject field. Basic level activities should be limited to simple circuit tracing, meter reading, and adjustment of components.

When structuring the content of unit 48 ("Pipe and tubing materials") into the course, the teacher must select appropriate projects in order to achieve course objectives. Projects involving cutting, fitting, and joining copper tubing can be used to develop these techniques and to make students aware of the total process of which each technique is a part. The degree of accuracy in accomplishing a particular project can serve as an assessment criterion. Assignment of numerous practice pieces is not a recommended strategy for teaching joining and forming skills.

Every effort must be made to involve students in a planned series of projects and work activities that provide practical reinforcement of their developing knowledge and expertise. The construction of working models or of a complete heating or cooling unit each year or

every other year is far more meaningful than projects that are seen by students as having no practical purpose.

Teachers with expertise in one of the major trade areas of this section may develop a theme with this trade focus. The optional content can be selected to support the core learning and to amplify the theme. In a course that emphasizes the theme of heating, for example, optional topics can be selected from the sheet metal section of the manufacturing module to support the ductwork aspects of warm-air heating, or from the plumbing section to support an emphasis on hot-water or steam heating. Some effort should be made to deal with alternative energy sources in the production of heat. The installation and maintenance of oil and gas burners can also be the bases for optional themes.

A teacher with a background as a refrigeration and air conditioning mechanic might choose to emphasize both aspects of this trade. This teacher could develop a course with the theme of air conditioning to support the core content and aims in Grade 9. The Grade 10 course could then emphasize the application of the core content to refrigeration systems.

In each grade, additional topics beyond the core content may be selected, from the list of course content for the construction grouping at the end of this module, to support the theme and to maintain student interest.

General Level

Course codes assigned to general level courses planned under this section will be TCH1G for Grade 9 and TCH2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- become proficient in the safe use of hand and power tools, torches, chemicals, and refrigerants regularly used in the trade;

- learn to complete with precision various operations involving bending, fitting, and joining of copper tubing and wiring;
- learn to recognize and solve problems, develop alternative solutions, and make choices;

- learn to use elementary test equipment, to make measurements (temperature, pressure, electrical, and mechanical), and to complete minor adjustments and repairs to individual components and systems;
- learn the physics of refrigeration – how heat is transferred, types of heat, intensity of heat, and quantities of heat;
- learn the operation of the refrigeration cycle and the functions of the main components in a refrigeration system;
- acquire an introductory understanding of electrical fundamentals, splices and joints, circuit protection, power consumption, and the use of simple test instruments to find faults;
- protect the safety of the individual and the group by developing safe work habits and a positive attitude towards safety in all work situations;
- develop a sense of pride in their basic trade skills and knowledge;
- develop a perspective on the construction industry and the role of the heating, refrigeration, and air conditioning trades within it;
- learn about employment opportunities and training and entry requirements for the trades and other specialized occupations associated with heating, refrigeration, and air conditioning;
- develop an understanding and respect for the role of energy in our society and for its efficient use and conservation.

Suggestions for Teachers

The learning activities planned for general level courses based on this section should be exploratory. Every effort should be made to involve the student in developing appropriate trade skills and performing a variety of work activities related to technology in this subject field. When selecting optional content for these courses, therefore, teachers should avoid theoretical topics such as heat gains, heat loss, relative humidity, comfort temperatures, system designs, ventilation, and control systems; these topics are more appropriate for Senior Division courses.

Suggestions outlined in the preceding section for basic level courses can be readily adapted to the planning of general level courses based on this section.

The topics in unit 1 (“Introduction”) of the core content are intended to provide students with background information related to work and further training opportunities in heating, refrigeration, and air conditioning occupations. This content can be presented most effectively through informal discussions when opportunities occur during the course.

The responsibility of every student to maintain a safe work environment should be discussed very early in the course. Students should be made aware of the roles of the Construction Safety Association and the Industrial Accident Prevention Association in maintaining safety

on the job. Safety rules related to specific operations, equipment, and environmental situations should be introduced and stressed during the course when the appropriate circumstances arise.

Some topics in unit 24 (“The conditioning of air”) overlap with topics in unit 27 (“Refrigeration systems”). Such topics include components and their functions, temperature and pressure cycles, and compression systems. Presentation of practical applications of these topics will facilitate learning.

Students should be made aware that proper system design is critical and that it requires meeting relevant standards. However, no attempts should be made in the Intermediate Division to teach the contents of written codes and standards.

Courses at the general level should develop the students’ skills and theoretical knowledge through practical projects and experiments. The sequence of these activities should provide the students with practical reinforcement of their developing knowledge and expertise. Construction of working models or of a complete heating or cooling unit over one or two years is more meaningful than projects that have no practical purpose in the students’ view. When developing the content of unit 48 (“Pipe and tubing materials”), the teacher

should select activities and projects that support knowledge and skill objectives and that are perceived by students as contributing to a larger theme.

The theoretical concepts identified in unit 49 ("Physics of heat") should be probed in conjunction with related practical activities. Measurements and calculations of quantities should be integral parts of this course work at the general level of difficulty.

The content of units 50 ("Fundamentals of electricity") and 51 ("Testing and measuring") is intended to develop the students' ability to make measurements of various physical parameters in the system, to read

instrument scales, and to interpret the readings relative to some specific standard. Introductory activities related to this content may focus on determining pressure, temperature, and electrical and linear values. However, as the activities become more complex, they may involve reading simple schematic diagrams, graphs, and tables; making calculations to check the readings; and relating measured and calculated values to manufacturers' specifications. For many students, it is through adjustments of pressure, temperature, and electrical values in the system and minor repairs of components that the electrical and mechanical aspects of the technology are most readily understood.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TCH1A for Grade 9 and TCH2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- learn to use hand tools, power tools, and other equipment to perform work tasks commonly required in the heating, refrigeration, and air conditioning industry;
- acquire safe work habits and a positive attitude towards the safety of others;
- learn to plan and perform tasks in a logical sequence;
- acquire an introductory understanding of electrical fundamentals;
- develop skill in using test equipment to check, maintain, and identify problems related to the installation and servicing of heating, refrigeration, and air conditioning equipment;

- describe the operation of the refrigeration cycle and explain the function of the various components;
- do trade calculations involving applications of physical laws related to heat;
- acquire an overview of the construction industry and a perspective on the role of the heating, refrigeration, and air conditioning trades within it;
- develop insights into energy consumption in our society and an understanding of the need for efficient use and conservation of energy;
- learn about employment opportunities in and training and educational requirements for the various occupations in the industry.

Suggestions for Teachers

The core content for courses in heating, refrigeration, and air conditioning at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 2.1.4. Students studying at the advanced level of difficulty can be expected to deal with the content in greater

theoretical depth, but theory should be perceived by students as a natural extension of their practical work. Suggestions in the preceding section for general level courses can be adapted for courses at the advanced level.

Emphasis should be placed on developing thinking skills necessary for practical problem solving. The ability to recognize superior design features in various models of equipment associated with the industry is a useful achievement in this direction. Advanced level courses should focus on these design considerations and problem-solving tasks more than general level courses do. This difference in focus should be reflected in the objectives for the course.

Where time permits, optional content may be selected from other subjects within the construction grouping or from related subjects in other groupings, such as blueprint reading or design studies. The optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. The content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students at the advanced level may undertake some of the topics as independent study, particularly in bi-level courses, where the advanced level may be differentiated from the

general level through the use of enrichment topics, themes, and special task assignments and projects. Students should be encouraged to explore the course content on their own. This exploration can be facilitated by written research assignments and oral presentations of technical reports. This approach works especially well with gifted students and those who show a particular interest in the course. To incorporate the concept of "language across the curriculum", evaluation of these assignments and reports should consider the student's use of language as well as the technical content.

Teachers should attempt to introduce information on career opportunities whenever possible, through newspaper and magazine articles, films and filmstrips, and career speakers from industry. School guidance counsellors are often a useful resource.

Heating, Refrigeration, and Air Conditioning

Senior Division

(Grades 11 and 12)

Senior Division courses in heating, refrigeration, and air conditioning may be offered at the basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the curriculum guideline *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963: Air Conditioning and Refrigeration*.

Courses planned under this subject guideline can prepare students for further training in and entry into the trade of refrigeration and air conditioning mechanic, as well as related occupations such as systems designer, sales technician, oil burner service mechanic, gas fitter, and central or room air conditioning servicer and installer. Training modules prepared by the Skills Development Ministry

to support occupations related to the heating, refrigeration, and air conditioning industry can also support objectives in courses for the Senior Division. (Information on this material is available from the directors of the regional offices of the Ministry of Education.) The modules may be utilized by schools as aids either in choosing specific subject content for Senior Division courses or in structuring a program that will facilitate further study at local colleges of applied arts and technology.

Courses planned for this subject area will have the letters TCH as the stem of their course code.

Plumbing and Pipefitting

Intermediate Division

(Grades 9 and 10)

Intermediate Division courses in plumbing and pipefitting will introduce students to the various types of skills and knowledge utilized in the plumbing trade and other pipefitting occupations. The possible vocational applications of this learning to both residential and industrial situations will be explored for career-planning purposes. Challenging opportunities in the pipefitting occupations are to be found in industrial plants such as oil refineries, petrochemical plants, pulp-and-paper mills, and food processing plants. As part of the course, students will become familiar with apprenticeship requirements for both the plumber and steamfitter trades as well as local training opportunities in these trades and related occupations. All students aspiring to careers in this subject field should be made aware that courses in other technological subjects (e.g., welding, drafting, and blueprint reading) and in mathematics are important co-requisites to their training.

Some students will use the learning acquired through the course personally rather than vocationally. The ability to plan, install, and maintain simple water supply and disposal systems is a useful asset in a home-owner.

Courses in plumbing and pipefitting are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 2.1.5 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, layout, building services materials, plumbing systems and fixtures, drainage systems, and venting.

Chart 2.1.5
Core Content for
Plumbing and
Pipefitting
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
1. Introduction	abcdeh	abcdefh
2. Safety	adgh	adgh
3. Project management	ab	abc
4. Layout	be	be
7. Building services materials	a	a
18. Insulating	d	d
21. Special machines	c	c
29. Plumbing systems and fixtures	ab	ab
30. Drainage systems	a	ab
31. Venting	a	ab
48. Pipe and tubing materials	a	a

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCP1B for Grade 9 and TCP2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- demonstrate proficiency in the safe use of the hand and power tools, measuring devices, torches, and soldering equipment regularly used in the plumbing and pipefitting trade;
- recognize and identify the various components and materials (such as cast iron, lead, steel, copper, and various plastics) regularly used in plumbing and pipefitting;
- demonstrate a general understanding of the requirements for installing, adjusting, and repairing simple plumbing systems;
- develop a positive attitude towards maintaining safety in the workplace;
- improve skills in interpreting both oral and written instructions pertaining to the plumbing trade;
- critically evaluate their own work and develop pride in its quality;
- develop a positive attitude towards working co-operatively with both peers and supervisors;
- acquire a perspective on the plumbing and pipefitting trade and learn about related occupational and training opportunities.

Suggestions for Teachers

In planning courses at the basic level, every effort should be made to include as much practical work as possible. It is important to demonstrate to students why they must develop basic skills before they can attempt a plumbing installation. A project that allows the students to solder a few fittings and then test whether or not they leak is a good way to illustrate the importance of developing a basic skill. Once the basic skills have been developed, students should be given the opportunity to install a plumbing fixture. It requires considerable planning to provide students with a well-rounded experience in the installation of various plumbing fixtures and ensure that space is available to accommodate these projects. Teachers should consider storing fixtures in an external area and bringing them in when they are required. A neat, orderly shop has a significant influence on students' housekeeping habits. It also provides a safer work environment.

Students in Grades 9 and 10 are investigating a series of possible occupational areas. They seldom have a clear picture of what opportunities exist in a particular trade. It is important

for a teacher to discuss with the students the various aspects of the plumbing and pipefitting trade and to point out the advantages and disadvantages of the trade. Topics in unit 1 ("Introduction") related to this background can be effectively presented in informal discussions.

The safety rules related to specific operations, equipment, and environmental situations identified in unit 2 ("Safety") should be presented as appropriate circumstances arise. General shop safety and the responsibility of every student to maintain it should be discussed at the beginning of the course and adhered to throughout the course. Students should also be made aware of the role of the Construction Safety Association in maintaining safety on the job.

The contents of unit 7(a) ("Building services materials") and unit 29 ("Plumbing systems and fixtures") can be treated together in accomplishing several of the aims. The selection of appropriate projects is fundamental to achieving the course objectives. Every effort must be made to involve students in a planned

series of practical activities that reinforce their developing knowledge and expertise. The nature and complexity of these experiences must, of course, reflect the level of difficulty at which the course is offered. Construction

of working models or of a simple plumbing system each year or every two years is more meaningful than projects that are seen by students as having no practical purpose.

General Level

Course codes assigned to general level courses planned under this section will be TCP1G for Grade 9 and TCP2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- complete various operations (such as measuring, cutting, threading, soldering, bending, fitting, assembling, and supporting) required for installing a pipe system to specifications;
- demonstrate some proficiency in the use and interpretation of federal and local plumbing codes;
- determine from drawings and specifications estimates of the materials required and the layout of simple water supply and disposal systems;
- demonstrate proficiency in the safe use of the hand and power tools, measuring devices, torches, and soldering equipment regularly used;
- develop a sense of pride in their achievements as they acquire skills and knowledge in the trade;
- develop safe working habits and positive attitudes towards the maintenance of a safe working environment for themselves and their fellow workers;
- acquire the knowledge they need to plan a career and to pursue further training and employment opportunities in occupations related to the plumbing and pipefitting field.

Suggestions for Teachers

Some of the suggestions outlined in the preceding section for basic level courses can be adapted for courses being planned at the general level of difficulty.

The plumbing and pipefitting courses offered to students at the general level of difficulty should be exploratory in nature. Students should be given as much information as possible about the various vocational opportunities associated with the skills learned in the course. Having a recently graduated employee return for a talk with interested students is often an excellent way of providing the students with some insight. Students should have an opportunity, if possible, to visit a construction site, see plumbing installations at various stages, and observe other actual operations.

Safety is an extremely important issue that must be dealt with continually. Safe soldering techniques, fire protection, proper methods of handling piping and other materials, and safe procedures for using power and hand tools are all important topics that must be taught. The shop should be well ventilated and be kept neat and clean.

Water heaters and water softeners are two applications that can support the topics outlined as core content under unit 29 (“Plumbing systems and fixtures”). The theoretical function and operation of water heaters and softeners can also be studied as optional content.

Although the courses at this level of difficulty should be mainly practical in nature, some fundamental theory of the trade should be introduced. Students should be evaluated in both the practical and theoretical aspects of the course, but with a strong emphasis on practical achievements. Short written tests involving a limited number of topics are often a better method of assessing student progress than an extensive exam. Frequently checking the student's progress on project work by

asking a few pertinent questions regarding activities related to the project is an excellent way of determining how well the student is doing. Students should be made aware at the beginning of the course that this form of evaluation will be used. Additional comments about the evaluation of student achievement are outlined on pages 2-3 of this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Plumbing and Pipefitting

Senior Division

(Grades 11 and 12)

Senior Division courses in plumbing and pipefitting may be offered at the basic and general levels of difficulty. Planning of these courses will continue to be based on the plumbing curriculum guideline in *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963*.

Courses planned under this guideline at the general level can provide a good base of introductory skills and knowledge for students who plan to enter apprenticeship in the trade of plumber or steamfitter. The training profile for these trades, prepared by the Skills Development Ministry, may be used as a resource when planning these courses.

Courses planned for the basic level can be aimed at students who are interested in plumbing for personal use or for use in other occupations such as building maintenance or heating, refrigeration, and air conditioning. Courses of this type may also be offered at the general level.

Courses planned for this subject area will have the letters TCP as the stem of their course code.

Building and Equipment Maintenance

Intermediate Division

(Grades 9 and 10)

Buildings and equipment of all types require maintenance from the time of construction to the time of demolition or replacement. Extended utilization and efficient service are the main purposes of such maintenance work. To do this type of work safely and efficiently requires training, practice, and the development of appropriate attitudes. The wide variety of structures and equipment requiring regular maintenance can best be served by workers with mechanical/technical aptitudes and the knowledge and skills associated with many of the basic trades. Work in this diverse career area offers the student an opportunity for scope, responsibility, and challenge.

Courses in building and equipment maintenance are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 2.1.6 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 2.1.6
Core Content for
Building and
Equipment
Maintenance
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	adeg	adefg
2. Safety	adgij	adgij
3. Project management	ad	ad
24. The conditioning of air		b
29. Plumbing systems and fixtures	a	a
30. Drainage systems	c	
32. Cleaning processes	ab	ab
37. General maintenance (equipment)	a	a
38. General maintenance (custodial)		cd
48. Pipe and tubing materials	a	a
52. Fire control	a	a

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCM1B for Grade 9 and TCM2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards maintaining safety in the workplace and using safe work habits when performing a task;
- develop the ability to use hand and power tools properly in building maintenance tasks;
- acquire general knowledge of basic operations in the trades normally involved in maintaining the various systems within a building;
- develop the ability to understand and follow both oral and written instructions;

- develop interpersonal skills and the ability to work with others co-operatively;
- critically evaluate their own work and develop pride in its quality;
- develop the ability to plan and perform a task involving building and equipment maintenance using a logical sequence of operations;
- acquire an understanding of the career opportunities involved in the building and equipment maintenance services.

Suggestions for Teachers

In Grade 9 courses, the knowledge and skills identified under core content and aims should be introduced through practical activities that each student can successfully complete. In courses at the basic level of difficulty, it is particularly important that each student gain confidence in his or her ability to master the learning. This learning should be linked to language and mathematical studies wherever possible.

The theory side of these courses can involve the study of the building and of systems for human shelter. The practical side can consist of the use and operation of tools, care and

operation of machines, and techniques used on related maintenance projects.

Courses in the second year (Grade 10) will review, in greater depth, the first year's work. New materials and equipment can be introduced in these courses. A theme for the second year of a course offered at the basic level of difficulty could be the service systems of a building, and the repair and adjustment of those systems. The concept of maintaining the environment to best serve human needs and comfort should be emphasized throughout courses at the basic and general levels.

General Level

Course codes assigned to general level courses planned under this section will be TCM1G for Grade 9 and TCM2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skill in the use of hand tools, power tools, and building services equipment;

- acquire understanding of various maintenance problems and of ways to proceed in solving them;
- develop familiarity with the properties and uses of maintenance materials;

- investigate a variety of preventive maintenance tasks;
- develop technical/mechanical aptitudes and special talents related to maintaining buildings and equipment;
- develop pride in their work on maintenance tasks and confidence in their ability to work responsibly on their own;
- acquire “safety consciousness” relative to their own work methods and the people for whom their services are performed;
- acquire knowledge of career opportunities in the building and equipment service industry.

Suggestions for Teachers

Students studying this subject at the general level of difficulty should be introduced to some of the basic theoretical concepts involved in the various systems within the building. Such systems as plumbing, electricity, heating, and air conditioning should be investigated. Although it is not essential for the students to understand all aspects of a particular system, they should be given a general overview. Repairing a water faucet and clearing a drain are the types of practical activities that should be considered when dealing with the plumbing system.

Teachers preparing courses in this subject should discuss the various systems with teachers or specialists who are familiar with work activities related to one or more of the systems. For example, a teacher who teaches electricity or a well-informed plumber may be able to provide excellent advice on the kinds of practical projects that can be incorporated into the course. Field trips to local plants or apartment buildings should be arranged so that students can acquire first-hand information on how these systems are serviced by professionals. The school itself is an excellent example of a functioning plant: students should learn how it is maintained.

Students may be given home assignments that require them to investigate the systems within their own dwellings, be they apartments or houses. In the former case, a letter from the

school requesting co-operation from the building superintendent may be required. It is very important for the teacher to emphasize the safety aspects of each system so that students will not endanger themselves or the systems during their investigations.

Student evaluation should be based mainly on achievements in practical assignments. Frequently students studying at the general level have difficulty with written material, and this problem should be taken into consideration in the assessment process. Short, individual, oral tests are often a much better measure of how much the student knows than are lengthy written tests. Additional comments about the evaluation of student achievement are outlined on pages 2-3 of this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Students taking courses in Grades 9 and 10 at the general level of difficulty should learn the basic skills more rapidly than those at the basic level and should move into group activities at an earlier stage. The selection of additional content beyond that specified in chart 2.1.6 should be made from the “Course Content for the Construction Grouping” section at the end of this module or from content listed in other subject groupings of Part B. Such content should support new projects or themes that students undertake.

Building and Equipment Maintenance

Senior Division

(Grades 11 and 12)

Building and equipment maintenance courses can prepare students for occupations ranging from the care of a private home to industrial plant maintenance and management. These courses are interdisciplinary and offer many opportunities for students to perform socially important tasks in the process of learning. Students should also learn to analyse maintenance problems and devise solutions involving skills related to various trades.

Students taking courses in this subject field will learn the importance of working efficiently, accepting responsibility, and being trustworthy. The many career opportunities that exist in this field, in all sectors of technological endeavour, require these traits.

Courses in building and equipment maintenance are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 2.1.7 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 2.1.7
Core Content for
Building and
Equipment
Maintenance
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	ade fh	ade fh
2. Safety	ab dgij	ab dgij
3. Project management	acd	acd
24. The conditioning of air		cd
29. Plumbing systems and fixtures	a	
30. Drainage systems	c	
32. Cleaning processes	abd	ab
36. Furniture care	a	
37. General maintenance (equipment)	c	b
38. General maintenance (custodial)	a	
50. Fundamentals of electricity	a	a
52. Fire control	a	

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCM3B for Grade 11 and TCM4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the interpersonal skills necessary to work co-operatively with peers and supervisors;
- acquire the skills and knowledge necessary to provide a preventive maintenance program;
- develop the confidence necessary to perform maintenance tasks on their own initiative;
- develop the ability to use both hand and power tools safely and efficiently;
- acquire the skills necessary to perform maintenance tasks related to the various systems within a building;
- develop communication skills appropriate to employment in the building and equipment maintenance trades;
- explore the variety of work tasks involved in occupations related to the building and maintenance trades.

Suggestions for Teachers

The core content for basic level courses in Senior Division focuses on various aspects of building maintenance and is intended to build on the core learning of Intermediate Division courses. Core content common to the two divisions will be reviewed and treated at greater depth in Senior Division courses. Optional content planned for Senior Division courses may either extend the study of building services or explore topics related to the maintenance of equipment.

Where feasible, Senior Division courses may stress particular building or equipment maintenance needs of local industry. This emphasis is most desirable when work experience or co-operative education programs can be established with local industry to reinforce and build on the skills that students acquire in school.

Students should investigate, in addition to the physical activities required on the job, the variety of written reports and forms that workers in these occupations may have to complete. Follow-up activities in the school,

related to these practical needs on the job, can reinforce and improve the students' communication skills.

Students in these courses should develop safe work habits. They should also develop an awareness of hazards to the safety of individuals wherever work is in progress. In building maintenance tasks, work sites should never be left in a condition that is not safe for others. The safety awareness that students develop in these courses should carry over into all of their activities.

As a wide variety of skills are taught in building and equipment maintenance courses, the "learn, use, teach" cycle can provide a useful strategy. In this cycle, the student first learns a skill under the close supervision of the teacher. During the use phase, the student applies the skill independently. The teach phase then requires the student to demonstrate the skill to another person. Usually this teach phase requires close initial support from the teacher to be effective.

General Level

Course codes assigned to general level courses planned under this section will be TCM3G for Grade 11 and TCM4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- solve problems, develop alternative solutions, and make choices relative to building and equipment maintenance;
- develop skills in the use of hand tools, power tools, and building services equipment;
- acquire understanding of various maintenance problems and of ways to proceed in solving these problems;
- develop familiarity with the properties and uses of maintenance materials;
- investigate maintenance tasks from a preventive maintenance perspective;
- acquire “safety consciousness” relative to their own work methods and the people for whom their services are performed;
- acquire knowledge of employment opportunities in the various occupations associated with building and equipment maintenance;
- acquire the interpersonal skills needed to function well in a service-oriented industry.

Suggestions for Teachers

The core content indicated in chart 2.1.7 for general level courses focuses on the general maintenance of both equipment and buildings. It is intended to continue the development of skill, knowledge, and attitudes introduced in the core learning for this subject in the Intermediate Division.

From the list at the end of this module, additional content may be selected to support themes concerning local employment opportunities in building and equipment maintenance. Content may also be selected from other subject groupings, such as horticulture or transportation, to further broaden the range of skills that may be utilized in occupations associated with this diverse field. In either case, the additional content should be selected to support learning objectives related to the aims.

Where possible, students should have opportunities in the Senior Division years to work in groups on projects that require co-ordination. These may be renovation projects on out-of-school sites. This type of project can sometimes be arranged in conjunction with social agencies and other groups in the community.

On-the-job work experience gives students the chance to apply and further develop the skills and knowledge acquired in school. It can also help them to form positive attitudes towards work and can provide insights into employment opportunities and related careers.

Suggestions in the preceding section for basic level courses can be adapted to suit general level courses.

Custodial Services

Intermediate Division

(Grades 9 and 10)

All buildings have to be cleaned and maintained. Doing this type of work efficiently requires training and practice. The variety of surfaces to be cared for, the equipment to be kept in working order, and the opportunities for both indoor and outdoor work make such jobs interesting and challenging.

Courses in custodial services offered during Grades 9 and 10 can provide students with opportunities to explore their aptitude for and interest in occupations in this service field.

Courses in custodial services are authorized for Grades 9 and 10 at the basic level of difficulty. Chart 2.1.8 identifies the core content. The aims and suggestions for designing courses are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 2.1.8
Core Content for
Custodial Services
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses
	<i>Basic</i>
1. Introduction	bcefg
2. Safety	adgi
3. Project management	a
13. Floor finishes	g
32. Cleaning processes	a
33. Cleaning washrooms	a
34. Window and glass cleaning and cutting	a
35. Waste collection	a
37. General maintenance (equipment)	d

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCS1B for Grade 9 and TCS2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to use both hand and power cleaning equipment safely and efficiently;
- acquire a sense of satisfaction in seeing a cleaning or maintenance task through to completion;

- develop the skills and knowledge necessary to plan and complete a cleaning and maintenance task;
- become familiar with the uses and applications of the various cleaning solutions;
- develop the ability to work with others cooperatively and effectively;
- develop safe and efficient practices for storage of equipment and supplies;

-
- acquire knowledge and understanding of maintenance problems and techniques for solving them;
 - acquire safe working habits and a positive attitude towards the safety of others;
 - acquire knowledge of careers and further training opportunities in the custodial services field.
-

Suggestions for Teachers

The development of students' co-ordination and confidence in performing tasks related to this subject should be the main objective of the Grade 9 course. The theory side of the course involves the study of consumable cleaning materials, structures, and service systems for human shelter. The practical side consists of the use and operation of tools, machines, and techniques in custodial projects.

The Grade 10 course will review in greater depth the content covered by the first-year course. Some new materials and more sophisticated equipment should be introduced. A basic understanding of the service systems of a building and techniques for effecting minor repairs and adjustments to those systems will be part of these courses. The human needs and comfort of building occupants should be given continual emphasis.

In dealing with the content of unit 2 ("Safety"), teachers should introduce safety rules related to specific materials, equipment, operations, or environmental situations when the appropriate circumstance arises. General shop safety and the responsibility of every student to maintain it should be discussed at the beginning of the course and closely adhered to throughout the course.

Students should be involved in a planned series of jobs and in experiments that provide practical reinforcement of their developing knowledge and expertise. For these activities to be meaningful to the students, their practical purpose must be clearly evident.

Students can be involved in making a simple floor plan of the school. The plan can then be subdivided into areas, and from this, a

schedule can be drawn up indicating what area each student is assigned to for custodial purposes. There should be a rotation in the schedule so that students have an opportunity to work in all areas. In this way, students can be introduced to some of the principles of drafting and can acquire an understanding of a floor plan. As the students progress, additional details can be added to their plan, such as the location of the fire alarm boxes and the fire extinguisher, the emergency exits, and other details that might be involved in the maintenance of the building.

Teachers should be aware of and sympathetic towards personality traits of students. A positive self-image and an attitude of satisfaction from work tasks that are well done are probably the most important traits that a teacher can attempt to develop in students who take these courses. Students should be made aware of the importance of maintaining a neat appearance. The ability to converse with others properly and pleasantly is another skill that the teacher should continually stress.

Students should become familiar with the terminology used in describing the various systems (plumbing, heating, lighting, etc.) within a building. Although custodians are not generally responsible for repairing such systems, they should recognize when something requires repairs and be able to report the fault.

Courses in custodial services can lead to the tangible goal of satisfying and rewarding employment for the student. Visits by workers and supervisors in this career field can provide useful career orientation for the student, even during the student's exploratory course.

Custodial Services

Senior Division

(Grades 11 and 12)

Students in this occupational area must be capable of working efficiently without supervision. They must be able to accept responsibility and assume the trust that these occupations often require. For people with these qualifications, many opportunities exist for employment in factories, office buildings, apartment complexes, and shopping malls and in the operation of their own businesses. Senior Division courses in custodial services can provide students with the opportunity to prepare for entry into an occupation in this service field.

Courses in custodial services are authorized for Grades 11 and 12 at the basic level of difficulty. Chart 2.1.9 identifies the core content. The aims and suggestions for designing courses at this level are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 2.1.9
Core Content for
Custodial Services
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses
	<i>Basic</i>
1. Introduction	bdfg
2. Safety	adgi
3. Project management	a
13. Floor finishes	bg
32. Cleaning processes	abce
34. Window and glass cleaning and cutting	b
35. Waste collection	b
37. General maintenance (equipment)	d
38. General maintenance (custodial)	bc

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCS3B for Grade 11 and TCS4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skill in the use of hand and power tools and equipment related to the cleaning and maintenance of residential and commercial establishments;
- develop pride in the quality of their work on maintenance tasks and confidence in their ability to work responsibly on their own;
- acquire knowledge and understanding of maintenance problems related to custodial and building services, and techniques for solving them;
- acquire safe working habits and a positive attitude towards the safety of others;
- acquire knowledge about employment and further training opportunities in the custodial services field.

Suggestions for Teachers

The skill and knowledge that students develop in Senior Division courses in custodial services should relate closely to the commercial practices of local business and industry. The proficiency acquired in Intermediate Division courses can be further developed. Graduating students should be able to accomplish custodial tasks confidently, independently, and to appropriate standards.

Topics listed as core content for Intermediate Division courses may be treated again, at greater depth, in the Senior Division. Core content may be augmented by topics listed at the end of this module or in any other, related subject grouping of Part B. Curriculum content appropriate to course themes based on local occupational opportunities may also be included as required.

Simple maintenance activities normally identified with janitorial or custodial occupations (e.g., plumbing, glass cleaning, lighting maintenance, floor sealing, tilesetting, grounds maintenance) can be treated as separate trade themes. Where school-related packages can be arranged, students planning to enter custodial service occupations will benefit from a combination of service-oriented courses in the related mechanics, construction, and horticulture trade areas.

Every effort should be made to integrate the students' academic work with the tasks performed in the custodial services course. Ratios (used in mixing chemical cleaners or pesticides) and linear measurement (used when producing simple floor plans) are the types of mathematical principles that should be dealt with. The greater the degree of integration between the students' academic and shop work, the easier it is for them to understand and appreciate the relevant theoretical principles.

For some of the specialized themes that may be taught in Senior Division courses, the "learn, use, teach" cycle can provide a useful strategy. The student first learns a skill under the close supervision of the teacher. During the use phase, the student applies the skill independently. The teach phase then requires

the student to demonstrate the skill to another person. Initially, the teach phase requires close support from the teacher to be effective.

The introduction of basic scheduling procedures for various tasks can provide the student with an insight into workloads and a sense of responsibility for the maintenance of part of a building.

Within a building, a variety of problems can develop that require action by a custodian. It is important for the teacher to discuss with the students such problems as broken windows, fires, flooding, excessive heating or cooling, and operation of the sprinkler system. In some cases the custodian can resolve the problem, but in other situations the problem will require a specialist. Students should be taught the emergency measures that should be taken.

Both indoor and outdoor pesticides should be discussed. Where, when, and how they should be used and the safety precautions and regulations that relate to their use should be taught.

The Grade 12 course should be oriented towards successful work experience. Ideally, students taking the custodial services program should be in co-operative education courses that involve up to half of their school time, so that they can obtain some functional vocational competence before graduation. Periodic review exercises to consolidate essential background knowledge are often of assistance to the student who is seeking entry into employment. In addition, themes related to building management concerns (e.g., comparing the costs and effectiveness of products and methods, using time effectively, and developing good interpersonal relations with clients, supervisors, and other workers) are conducive to successful work experience. Additional diploma credit may be built into these Senior Division courses for planned out-of-school work components within the co-operative education guidelines.

Painting and Decorating

Intermediate Division

(Grades 9 and 10)

Painting and decorating is a worldwide industry and one of the oldest known. Courses offered in the Intermediate Division will provide students with opportunities to explore the types of skill and knowledge associated with preparing surfaces and applying various material coverings. As well, these courses can assist students in developing aesthetic perception and pride in the quality of their work.

Courses in painting and decorating are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 2.1.10 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety; basics for painting; and preparation, priming, and finishing.

Chart 2.1.10
Core Content for
Painting and
Decorating
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	bcd	bcdefgh
2. Safety	adgijk	adgijk
3. Project management		ae
23. Finishing		abc
40. Basics for painting	a	ab
42. Preparation, priming, and finishing	b	b
44. Weathering and surface deterioration		a
45. Wall coverings		a

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCD1B for Grade 9 and TCD2B for Grade 10.

Aims

- In all courses based on this section, students will have the opportunity to:
- develop a positive attitude towards safe work habits;
 - develop the skills necessary to use properly the tools, materials, and climbing equipment involved in the painting and decorating trade;
 - improve the communication skills required to function in the various occupations related to the painting and decorating trade;
 - develop the skills and attitudes necessary to work co-operatively with peers and supervisors;
 - develop the ability to systematically plan the steps necessary to complete a decorating task;

- acquire a sense of satisfaction in completing work tasks properly;
- acquire knowledge of the careers and further

training opportunities available in the painting and decorating field.

Suggestions for Teachers

Courses in painting and decorating offered in Grade 9 at the basic level of difficulty should introduce students to the skills of these trades through simple activities and projects that they can complete successfully. The difficulty of the skill or activity that is introduced should increase steadily at a rate that challenges the student but that still allows for success. Math studies should be repeatedly reinforced through problems associated with the mixing, estimating, and costing of the materials needed for projects.

Small-group activities and projects should become a part of the students' experience soon after the basic skills are learned. Out-of-school projects in the community can be a valuable component of the course work in Grade 10. Group activities provide good opportunities for working on course objectives related to the attitudinal aims such as safety awareness and the ability to work co-operatively.

Courses in painting and decorating can provide students with the opportunity to develop skills and knowledge that they can use in decorating their own homes or apartments. Some students will become skilful enough to take on part-time painting jobs.

If time permits, the course may expand into other interesting areas, such as furniture refinishing or sign painting. Frequently, charitable organizations require large banners with the name of the association printed on them. This type of project provides the students with the opportunity to learn some basic skills in sign painting while producing a useful item.

Refinishing a piece of furniture brought from home can be great fun and should be encouraged once the students have developed sufficient skills to do it efficiently. At the Intermediate level, it is wise not to allow the students to bring in a very large piece of furniture; instead, they might work on a footstool or small chair.

Students must learn to take the time to properly prepare the surface they are about to decorate. They must understand that unless the surface is clean and free of blemishes, the finished product will never have a professional appearance.

It is also important to develop an appreciation for a clean, neat site while performing a task. The importance of using drop sheets and cleaning up the site and equipment after the task is completed must be stressed.

The students should be taught to assemble at least a single-tier scaffold and to appreciate the importance of securing it properly. Both extension and step ladders are in frequent use by painting and decorating tradespeople, so students need to understand when and where to use each type.

As students become involved in the various work tasks associated with painting and decorating, they should develop an increasing awareness of hazards that can develop at the worksite. In addition to developing safe work habits, students should be motivated to take remedial action in order to maintain a safe environment. Worksites should never be left in a condition that is not safe for others. Attitudes towards safety awareness that students develop in these courses should carry over into all of their other activities.

General Level

Course codes assigned to general level courses planned under this section will be TCD1G for Grade 9 and TCD2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skills in the application of materials to various types of surfaces, using tools and equipment appropriate to the trade;
- master and apply safe work methods and procedures in the performance of tasks associated with the trade;
- identify and investigate scientific concepts related to the manufacture, nature, and

application of materials used in the painting trade;

- solve problems, develop alternative solutions, and make choices related to the trade;
- develop pride in the results of their painting and decorating and confidence in their ability to work responsibly on their own;
- acquire knowledge of the careers and further training opportunities in painting and decorating.

Suggestions for Teachers

General level courses in painting and decorating for Grades 9 and 10 should cover the core content faster than basic level courses do.

Subunits from four additional units (“Project management”, “Finishing”, “Weathering and surface deterioration”, and “Wall coverings”) are included in the core content for general level courses.

The topics in unit 1 of the core content can be effectively presented in informal discussions at various times during the course.

General shop safety (unit 2) and the responsibility of every student to maintain it should be discussed at the beginning of the course. Students should also be made aware of the roles of the Construction Safety Association and the Industrial Accident Prevention Association in maintaining safety on the job. Safety rules related to specific operations, equipment, and environmental situations should be introduced when the appropriate circumstances arise.

The content in unit 3 (“Project management”) deals with reading a simple architectural drawing for estimating purposes. Where it can be arranged, the teacher may cover this content in co-operation with the drafting teacher, who can offer a related blueprint-reading course.

Units 23 (“Finishing”), 40 (“Basics for painting”), and 42 (“Preparation, priming, and finishing”) involve preparing the surface for application of a finish. Students should have the opportunity to prepare a variety of sample pieces of material and to apply various types of finishes. Some samples may have an existing finish that must be removed before a new finish can be applied.

Weathering and surface deterioration (unit 44) is an important topic involving chemical reactions. These could be discussed with the students in their science program.

Students in the general level program are taught basic skills involving wall coverings (unit 45). Everyone in the class should have the opportunity to strip paper off a surface, prepare the wall for resurfacing, and apply a new surface.

If time permits, students at the general level should have a chance to become involved in sign painting (unit 41). Students should be allowed to use their imaginations in the design of these optional projects.

Small-group activities and community projects should be planned for Grade 10 general level courses. These activities may involve optional topics from the course content for the construction grouping, listed at the end of this module.

Painting and Decorating

Senior Division

(Grades 11 and 12)

Courses offered in the Senior Division will focus on the skills and knowledge associated with the regulated construction trade of painter (commercial/residential and industrial). Students will perform interior and exterior work on a variety of surfaces and learn to apply a wide range of coverings to surfaces. Courses will aim at not only the acquisition of hand skills but also the development of aesthetic perception and pride in one's work. Students specializing in this subject field will gain insights into the broad field of construction and knowledge of the related employment opportunities in painting and decorating.

Some students may wish to specialize in the art of sign painting. This is an area that offers

a wide range of vocational opportunities. The skills and knowledge developed at the high school level can be further developed at a community college.

Courses in painting and decorating are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 2.1.11 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 2.1.11
Core Content for
Painting and
Decorating
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction	bcdefgh	bcdefgh
2. Safety	adgijk	adgijk
3. Project management	e	ae
23. Finishing	abc	abcd
40. Basics for painting	ab	abc
41. Sign and poster making	a	abc
42. Preparation, priming, and finishing	ab	ab
43. Interior and exterior decorating	a	ab
44. Weathering and surface deterioration	ab	abc
45. Wall coverings	a	ab

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TCD3B for Grade 11 and TCD4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- solve problems, develop alternative solutions, and make choices relative to painting and decorating activities;

- become skilled in applying materials to a variety of surfaces using equipment and tools appropriate to the trade;
- develop pride in the quality of their painting and decorating and confidence in their ability to work responsibly on their own;

- identify and investigate scientific concepts related to the manufacture, nature, and application of materials used in the painting trade;
- acquire knowledge of the employment opportunities in and the training and entry

requirements for specialized occupations associated with the painting and decorating trade and the construction industry in general.

Suggestions for Teachers

Courses offered in Grades 11 and 12 at the basic level of difficulty will treat at greater depth the core content covered in the Intermediate Division. Subunits from six additional units are included in the core content for basic courses in the Senior Division.

The topics in unit 1 (“Introduction”) provide background information about the trade and can be reinforced and further developed in informal discussions at various times during the course. It is important for the teacher to discuss with the students the various career opportunities in this trade. Teachers should bring in a variety of tradespeople during the year and allow the students to discuss with them the advantages and disadvantages of their trades. Students should also be made aware of the advantages and disadvantages of self-employment. Work experience and co-operative education are excellent ways for students to determine which occupational path they would like to pursue. These two forms of out-of-school activities also provide students with valuable opportunities to practise the skills they have been introduced to in school.

The topics in unit 2, “Safety”, must be dealt with continually throughout the program. Certain jobs in painting and decorating can be dangerous if safety precautions are not carefully observed. The proper handling and storage of chemicals and flammable solutions must be carefully and thoroughly taught. Students should also be made aware of the roles of the Construction Safety Association and the Industrial Accident Prevention Association in maintaining safety on the job. Safety rules related to specific operations, equipment, and environmental situations should be introduced only when the appropriate circumstances arise. Students in the Senior Division should be encouraged to recognize hazardous situations on the job and motivated to remedy them.

Students interested in entering a painting and decorating trade should be able to estimate with confidence the amount of material required to cover a surface. Students should also learn how to determine the cost of completing the task. Frequently, estimates must be made from a set of architectural drawings and specifications. Students should acquire some understanding of architectural blueprint reading so that they can acquire dimensions from a drawing for estimating purposes. Problems related to costing of materials and estimation of overall job costs should require students to apply mathematical and simple business principles.

The skills and knowledge outlined in the topics of units 23 (“Finishing”), 40 (“Basics for painting”), and 42 (“Preparation, priming, and finishing”) should be reinforced and further enhanced in each of the projects that students undertake in their Senior Division courses. These topics identify the fundamental skills and knowledge that students require to enter the painter trade.

The content of unit 43 (“Interior and exterior decorating”) introduces students to colour, light, and a wide range of other factors that determine the overall visual effect in an area that is being decorated. Teachers can effectively demonstrate some of the finer points of decorating by showing the students slides of good and poor decorating schemes.

In Senior Division courses, all students should acquire skills in wallpapering (unit 45). Students highly interested in this area should have opportunities to spend extra time on projects involving this type of work.

Senior Division courses should prepare students to progress steadily from group projects in school and in the community to work experience and on-the-job training with an employer.

General Level

Course codes assigned to general level courses planned under this section will be TCD3G for Grade 11 and TCD4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skills in the application of materials to various types of surfaces, using tools and equipment appropriate to the trade;
- master and apply safely the methods and procedures of the trade;
- identify and investigate scientific concepts related to the manufacture, nature, and application of materials used in the painting trade;
- solve problems, develop alternative solutions, and make choices related to the trade;
- develop pride in the quality of their painting and decorating and confidence in their ability to work responsibly on their own;
- acquire knowledge of the employment opportunities in and the training and entry requirements for the other specialized occupations associated with the painting and decorating trade and the construction industry in general.

Suggestions for Teachers

Teachers planning courses at the general level of difficulty should review the suggestions for teachers in the preceding section for basic level courses. Many of those suggestions can be adapted to the planning of general level courses in this subject.

Core content that is covered in both Intermediate and Senior Divisions should be treated at greater depth in Senior Division courses. Activities planned around this content can reinforce the Intermediate Division work and support the more sophisticated objectives of Senior Division courses.

At the general level, content related to the science of paint technology, such as colour and adhesion, should be reinforced in the students' science courses if possible.

Mathematics can be reviewed in applications such as the costing of project materials and the development of estimates for larger jobs in the community. The latter activity can also give students practice in applying some simple business principles used by self-employed workers.

In discussions of general shop safety and the responsibility of students to maintain it, students should be made aware of the roles of the

Construction Safety Association and the Industrial Accident Prevention Association in maintaining safety on the job. Safety rules related to specific operations, equipment, and environmental situations should be introduced or reinforced when the appropriate circumstances arise.

Sign and poster making (unit 41) can offer a wide range of very interesting and challenging activities. Projects can range from a sign or poster to be used in the school to a sophisticated neon display. The opportunities for employment in this field are diverse. Students who show interest and have some artistic talents should be encouraged to undertake challenging projects.

Students may be introduced to a variety of special finishing effects such as graining, gilding, marblizing, and antiquing. Small pieces of various types of materials should be used when developing these skills. Eventually the students may apply one or more of these effects in a functional project.

Students studying at the general level of difficulty should be made aware of the opportunities in the field of interior design and the availability of further training and education

at a community college. To familiarize students with this field, a major theme on design, involving topics from the graphics and possibly the textiles grouping, should be considered.

Students should have the opportunity to visit trade shows to see the latest materials and techniques being used. Wallpaper and paint manufacturers often have excellent display rooms that can be visited on request. In some cases, demonstrations of the application of a new material can be arranged.

When students have developed a reasonably high level of proficiency in decorating, the teacher may arrange to have groups of two or three take on a job in the community. Senior citizens or a family with limited financial

means may have a room they would like decorated. Students who undertake such projects should be involved in the planning and designing of the job, the estimating of materials, and all the work required to see the project through to completion.

Work experience and co-operative education should be a significant component of the Grade 12 course. Wherever possible, such experience should be scheduled as suggested in the guidelines for co-operative education. This combination of in-school and out-of-school learning can provide students with a good perspective on career opportunities in this field. Visits by tradespeople and contractors who are familiar with this aspect of the construction industry can also provide students with useful career insights.

Summary of Core Content for Courses in the Construction Grouping

Chart 2.1.12

Content Units	Woodwork (Grades 9-10)		Masonry and Trowel Trades (Grades 9-10) (Grades 11-12)				Heating, Refrigeration, and Air Conditioning (Grades 9-10)		Plumbing and Pipefitting (Grades 9-10)	
	Basic	Gen/Adv	Basic	General	Basic	General	Basic	Gen/Adv	Basic	General
1. Introduction	ab	abde	abde	abdefh	abde	abdefh	abde	abdef	abcdeh	abcdefh
2. Safety	abi	abi	abcij	abcij	abcij	abcij	abdfgk	abdfgk	adgh	adgh
3. Project management	a	abc	ab	cde	a	ac	ad	abcd	ab	abc
4. Layout	ab	abc	b	abe	abe	abde	b	b	be	be
5. Woodworking trades materials	a	ab								
6. Trowel trades materials and processes			a	abc	abcd	abcd				
7. Building services materials							b	b	a	a
8. Foundations	bce	bcde			abef	abef				
9. Floor and ceiling construction	e	abcefh			a	ach				
10. Wall construction	c	acd	e	e	ef	ef				
11. Roof construction	a	abf								
12. Wall and ceiling finishing		g	c	c	acd	acd				
13. Floor finishes		d			ab	abc				
14. Stairs										
15. Chimneys, fireplaces, and barbecues					a	a				
16. Concrete construction			a	a	ab	ab				
17. Basic brick- and blocklaying			a	a	ab	ab				
18. Insulating	a	ac					abce	abce	d	d
19. Truing rough lumber by hand	b	ab								
20. Truing rough lumber by machine	ace	abcdef								
21. Special machines	a	a			b	b			c	c
22. Joining and fastening wood	b	abd								
23. Finishing	a	ac								
24. The conditioning of air							ac	abc		
25. Heating and cooling calculations							a	ab		
26. Refrigeration							a	ab		
27. Refrigeration systems							a	a		
28. Charging a system								a		
29. Plumbing systems and fixtures									ab	ab
30. Drainage systems									a	ab
31. Venting									a	ab

**Building and Equipment Maintenance
(Grades 9-10) (Grades 11-12)**

<i>Basic</i>	<i>General</i>	<i>Basic</i>	<i>General</i>
adeg	adefg	adefh	adefh
adgij	adgij	abdgij	abdgij
ad	ad	acd	acd

**Custodial Services
(Grades 9-10) (Grades 11-12)**

<i>Basic</i>	<i>Basic</i>
bcefg	bdfg
adgi	adgi
a	a

**Painting and Decorating
(Grades 9-10) (Grades 11-12)**

<i>Basic</i>	<i>General</i>	<i>Basic</i>	<i>General</i>
bcdf	bcdefgh	bcdefgh	bcdefgh
adgijk	adgijk	adgijk	adgijk
	ae	e	ae

g

bg

abc

abc

abcd

b

cd

a

a

a

c

c

Content Units

Woodwork
(Grades 9-10)Masonry and Trowel Trades
(Grades 9-10) (Grades 11-12)Heating,
Refrigeration, and
Air Conditioning
(Grades 9-10)Plumbing and
Pipefitting
(Grades 9-10)

Basic Gen/Adv

Basic General Basic General

Basic Gen/Adv

Basic General

32. Cleaning processes

33. Cleaning washrooms

34. Window and glass cleaning and
cutting

35. Waste collection

36. Furniture care

37. General maintenance (equipment)

38. General maintenance (custodial)

39. Work and energy

40. Basics for painting

41. Sign and poster making

42. Preparation, priming, and
finishing

43. Interior and exterior decorating

44. Weathering and surface
deterioration

45. Wall coverings

46. Quantity production

47. Shop computers

48. Pipe and tubing materials

a

a

a

a

49. Physics of heat

a

50. Fundamentals of electricity

a

51. Testing and measuring

a

52. Fire control

See "Course Content for the Construction Grouping", beginning on page 52, for description of the subunits a, b, c, etc.

Building and Equipment Maintenance (Grades 9-10) (Grades 11-12)				Custodial Services (Grades 9-10) (Grades 11-12)		Painting and Decorating (Grades 9-10) (Grades 11-12)			
Basic	General	Basic	General	Basic	Basic	Basic	General	Basic	General
ab	ab	abd	ab	a	abce				
				a					
				a	b				
				a	b				
		a							
a	a	c	b	d	d				
	cd	a			bc				
						a	ab	ab	abc
								a	abc
						b	b	ab	ab
								a	ab
							a	ab	abc
							a	a	ab
a	a								
		a	a						
a	a	a							

Course Content for the Construction Grouping

1. Introduction

- a) Care of the shop; course outline; student responsibilities;
- b) description of trades; employment possibilities; union affiliations; apprenticeship requirements;
- c) physical requirements of trades (climbing, balancing, etc.);
- d) educational requirements; history of trades;
- e) identifying, using, and caring for tools; work schedules;
- f) employee-employer relations; workload; stock control; forms processing; basic shop practices; staff problems; routines; warehousing; property ownership and management security; applied English (writing reports, ordering materials);
- g) customer and interpersonal relations;
- h) licences; ethical practices.

2. Safety

- a) Accident prevention and safe work habits in the shop and on the job site; basic first aid procedures; fire prevention and fire safety regulations; the roles of the Construction Safety Association and the Industrial Accident Prevention Association;
- b) safety requirements for the use of electrical power; development of a positive attitude towards safety;
- c) placing and piling materials; using a wheelbarrow properly; precautions required in excavating;
- d) using acids safely and properly; controlling flammable liquids;
- e) properly operating a forklift and/or a front-end loader;
- f) occupational health and safety legislation; precautions in the use and handling of refrigerants;
- g) hazards of exhaust fumes; control of gases;
- h) precautions in the use of cements and fluxes;
- i) lifting techniques; using and caring for hand and power tools; electrical precautions;
- j) scaffold building and loading;
- k) using pressurized gases and liquids safely; personal cleanliness (washing hands before eating); controlling toxic dust; modern safety clothing and equipment.

3. Project management

- a) Reading and interpreting simple plans and specifications;
- b) basic quantity analysis and costing;
- c) designing and drawing plans for simple projects using appropriate design criteria and drafting techniques; interpreting and using local and national building codes, including the appropriate NHA, zoning, plumbing, heating, electrical, and air conditioning codes and standards;
- d) using service and parts catalogues and indexes; preventive maintenance schedules;
- e) financing and scheduling; storing materials; controlling inventory.

4. Layout

- a) Procedures and techniques for transferring sizes and shapes from plans to project materials and systems;
- b) using tapes, rules, squares, levels, gauges, and other layout tools correctly; using appropriate measurement terms and systems, including metric;
- c) 3-4-5 and diagonal squaring;
- d) setting property, building, sewer, and other key lines of control;
- e) determining and setting elevation, grades, and slopes;
- f) constructing and using batterboards.

5. Woodworking trades materials

- a) Standard sizes and grades of lumber and plywood; particle board and plywood; defects and blemishes in lumber and their effects on strength and appearance; kiln and air drying;
- b) plain sawing and quartersawing;
- c) structure and growth of trees; wood identification and cell structure;
- d) veneer types; manufacture and uses of plywood and veneer board;
- e) advantages and uses of various composition boards such as tentest, masonite, particle board, plastics, and plastic laminates; costing – lineal foot, square foot, board foot.

6. Trowel trades materials and processes

- a) Mortar, concrete, and plaster mixes; water-cement ratio and the use of aggregates, clean water, and accurate and complete mixing procedures; storage of materials; block and brick types, sizes, manufacture, testing; bonding in brick, block, and stonework;
- b) types, purposes, and grades of aggregates;
- c) testing concrete; fire ratings;

- d) sizes and classifications of tile; stone types; sizes, weights, and properties of wall tiles, including ceramic and glass; adhesives and grouting materials (uses and application techniques);
- e) lathing materials and systems; plaster and drywall materials and systems; fire-retarding qualities of gypsum wallboard.

7. Building services materials

- a) Sizes, lengths, uses, weights, and properties of steel, cast iron, lead, copper, and plastic pipes and tubing; cutting and joining techniques, including swaging, flaring, bending, soldering, brazing, threading, reaming, and joining with adhesives and mechanical and threaded fittings;
- b) properties of and safety precautions for using refrigerants; valves, clean-cuts, and all fittings for various pipe and tubing systems.

8. Foundations

- a) Basic soil types; excavation methods and sizing for foundations and services;
- b) safety;
- c) checking levels, squaring, and constructing simple footing forms;
- d) types, sizes, and construction of simple footings (NHA standards);
- e) wall types, materials, and sizes (NHA standards); form construction; waterproofing (including drain tile types and systems, parging, drainage gravel, tile beds, and waterproofing membrane);
- f) reinforcing concrete foundation units – materials and techniques; determining access and positioning for drains, sewers, and wiring;
- g) installing window and door frames;
- h) treated wood foundations; material estimates.

9. Floor and ceiling construction

- a) Basic floor types, including concrete, to suit masonry and wood-frame systems; forming and reinforcing concrete floors;
- b) sill types; anchoring techniques;
- c) columns, beams, and girders – sizes, spacing, and installation (NHA and safety standards);
- d) materials, sizes, and spacing of floor joists (NHA standards);
- e) bridging – types, purposes, positioning, and installation; rough openings – sizes, positioning, and framing techniques (NHA and safety standards);

	<ul style="list-style-type: none"> f) ceiling construction similarities with floors; g) material estimates; h) construction techniques for entry and passage of services through floor framing and concrete; use of gyproc and metal lath; suspended system; repair work, including preparation, repairing, and finishing techniques.
10. Wall construction	<ul style="list-style-type: none"> a) Platform – balloon, braced, and post-and-beam framing systems; wall plates – stud positions and sizes; corners and wall intersections (NHA standards); rough-opening sizing and construction techniques; bracing types – their advantages and disadvantages; b) sheathing types (NHA standards); c) frame layout and assembly – squaring, plumbing, and bracing techniques; safety; d) material estimates; e) masonry systems (including solid, cavity, bearing, and non-bearing types); using brick, block, and tile in appropriate combinations and bonding styles; f) lintel and sill construction, including sizes when using wood, steel, and concrete (NHA standards); mortar joint sizes and finishing allowances for plumbing, heating, and electrical services; repair work and finishing techniques; g) methods of insulating; h) door buck and metal frame positioning, plumbing, and bracing; allowances, construction techniques, and adaptations for heating, electrical lines, ducts, and insulation.
11. Roof construction	<ul style="list-style-type: none"> a) Assembly procedures, rafter installation, and use of collar ties and gable end studs; safety; b) framing terminology (<i>rise, run, span, pitch, line length, ridge, overhang, birds-mouth, etc.</i>); material sizes and rafter spacing (NHA standards); common rafter – layout by step-off or line length, including basic calculations and use of the framing square rafter tables; c) advantages of flat, shed gable, and hip or cottage styles; d) sheathing techniques using boards and sheet goods; chimney and vent allowances; types and installation of asphalt shingles, ridge caps, and flashing for chimneys and vents (NHA and safety standards);

	<ul style="list-style-type: none"> e) roof trusses – types and advantages of each; f) material estimates.
12. Wall and ceiling finishing	<ul style="list-style-type: none"> a) Drywall systems, including cutting, fitting, fastening, taping, and finishing; acoustical plastering; stucco; special finishes; b) lath and plaster systems, including lathing installation techniques, grounds, beads cornerite, scratching, featheredging, straightening, two- and three-coat work, beams, arises; ornamental bench work using templates, running moulds, mitring, sticking, and planting; ornamental plastering – layout, templates, moulds, screeds, arches, niches, columns, cornices; casting, including mould treatments; repairing and finishing damaged areas; c) tiling systems and installation procedures; layout procedures; plumbing, levelling, and straightening techniques; d) brick and masonry veneer and facing systems, including pattern bonds and structural bonds; e) panelling systems, including basic strapping layout and installation, panel fitting, and fastening techniques; f) door- and window-frame installation procedures; g) trimming styles and techniques for doors, windows, baseboards, and cornices; siding – advantages of and installation procedures for various types of horizontal and vertical siding, wood, metal, shakes, and sheet goods.
13. Floor finishes	<ul style="list-style-type: none"> a) Screeding, compacting, and hardening procedures for concretes; styles and techniques for various trowelled and float finishes; b) special finishes, including non-slip; c) terrazzo finishing – preparation of base, grounds and beads, design and proportions for topping, grinding techniques; d) wood flooring – types and installation procedures; material estimates; e) sheet goods – tile and carpet types, layout, and installation; f) repair methods for damaged areas in all types of floor finishes; g) maintenance of wood, tile, terrazzo, concrete, carpet, and other floor types; care of sheet goods, carpets, and static floors.

14. Stairs	a) Basic stair construction, details and parts; standard sizes, calculations; handrails, safety concepts; forms for concrete stairs.
15. Chimneys, fireplaces, and barbecues	a) Types of chimneys – flue liners, hardware, fume problems; prefabricated and built-up fireplace styles – roughing in, hardware, brick and stone designs, finishing, draft-control systems; barbecue design and construction – proximity to house, interior barbecue problems, and fume control.
16. Concrete construction	<p>a) Proper techniques for measuring, mixing, and pouring concrete in various strengths and positions; using and applying key additives; effects of temperature and moisture on curing; curing methods, including special agents; repair work and finishing techniques;</p> <p>b) uses and purposes of the varieties of concrete, including normal, high early strength, and watertight; frost control; types and construction of forms for basic concrete units, including slabs, footing, columns, walls, and beams; form release agents and techniques; safety; basic reinforcing needs and techniques.</p>
17. Basic brick- and blocklaying	<p>a) Basic tools, pointing mortar joints; glossary and trade terms; using lines, levels, and story rods appropriately; spreading mortar; laying brick and block; building corners; bonds; cutting bricks and blocks; using and installing special courses and anchors; control joints;</p> <p>b) estimating bricks, blocks, stones, and mortar.</p>
18. Insulating	<p>a) Insulation types and installation techniques;</p> <p>b) R factors, heat loss, heat gain; relative advantages of rock wool, fibreglass, vermiculite, rigid and poured foam systems;</p> <p>c) vapour barriers – types, positions, and installation procedures;</p> <p>d) insulating water pipes;</p> <p>e) heating and cooling ducts.</p>
19. Truing rough lumber by hand	<p>a) Calculating rough size required; selecting material – type of wood, blemishes and defects;</p> <p>b) order of surface finishing for truing stock; using various layout tools – squares, rules, straight edges, gauges; selecting and using appropriate saws for crosscuts or ripping;</p>

	selecting and using appropriate hand planes to achieve flat, smooth, and square surfaces; checking accurately for flatness, square, straight, and parallel.
20. Truing rough lumber by machine	<ul style="list-style-type: none"> a) Order of surface finishing; selecting machines and machine allowances for working; crosscutting on a radial arm saw – safety, hand positions, stop blocks; using the jointer to machine a flat surface and a square edge – safety, use of push blocks, hand positions, guards, size of cut, limitations on size of material, grain direction; b) adjustment and special operations on the jointer – bevels, tapers, etc.; c) using thickness planer to machine lumber to correct thickness – safety, size of cut, adjustments, maximum and minimum sizes, grain direction; d) special operations on the thickness planer, including tapering, planing thin stock, planing short stock, using jigs; e) using a variety saw to cut to width – safety, hand positions, proper use of guard and push sticks, blade height, fence; crosscutting – mitre gauge, hand positions; f) special operations on the variety saw, including bevel, dado, tenons.
21. Special machines	<p><i>Note: The following machines and any others that the teacher considers appropriate should be used to complete special operations as required for student projects. In all cases, the proper procedure for the required operation should be taught, with a strong emphasis on safety.</i></p> <ul style="list-style-type: none"> a) Portable jigsaws and circular saws; band saws and jigsaws; hollow chisel mortiser; drill press; portable sander; disc, belt, and spindle sanders; lathe; shaper and portable router; b) power trowels; masonry saws; c) threading machines.
22. Joining and fastening wood	<ul style="list-style-type: none"> a) Types, purposes, and advantages of various types of glues and clamps; b) layout cutting and fitting mortise and tenon, dowel, dado, rabbet, edge-to-edge, lap, mitre, and other wood joints; types, sizes, and uses of nails; positioning of nails and number required; driving techniques; wood screws – types, sizes, installation procedures; screwdriver types – advantages, uses;

	<ul style="list-style-type: none">c) clamps – design and construction of special jigs and clamping devices;d) miscellaneous hardware (bolts, lag screws, expansion shields, cabinet locks, pulls, hinges, catches, toggle bolts).
23. Finishing	<ul style="list-style-type: none">a) General sanding and clean-up techniques; types, grades, advantages of various abrasive papers and materials; colouring wood; types of stain, paints, and fillers – their uses and application; sealing procedures using shellac, lacquer, and other sealers; protecting the surface – varnish, lacquer, oil finishes; French polish; solvent types for various finishing materials; choosing, caring for, and using brushes;b) using paint and varnish remover to strip off old finishes;c) smoothing and polishing with various rubbing compounds and materials;d) refinishing furniture (antiques);e) liquid and paste waxes.
24. The conditioning of air	<ul style="list-style-type: none">a) Definitions and purposes of heating and cooling systems; air conditioning units – their construction and operating principles; types of distribution, purification, and humidification systems;b) history of heating; heating methods – hot water, steam, electric, solar; fuels – gas, oil, coal, electricity;c) air circulation; types of conditioning – heating, cooling, humidity, filtering; air filters – types, efficiency, applications, installations, maintenance (cleaning, oiling), and records;d) distribution systems; heating methods – gas/oil furnace construction and operation; comparison of types of residential heating and/or cooling systems; ventilation; control systems and techniques; humidity – control techniques; solar technology and alternative energy studies; basic types, application, control, and maintenance of pumps, compressors, and heating and air conditioning equipment.
25. Heating and cooling calculations	<ul style="list-style-type: none">a) Heat loss/gain; heat flow; insulations; R factors; effects of windows and doors;b) calculation of residential cooling and heating loads; dry- and wet-bulb temperatures; relative humidity; dew point; air velocity; psychometric chart; comfort temperatures; heat transfer.

26. Refrigeration	<ul style="list-style-type: none">a) Definition, properties, and measurements of heat; sensible and latent heat; effects of pressure on a gas; effects of heat on a body; changes in state and volume; temperature – description and measurement;b) Boyle's, Charles's, and Dalton's laws.
27. Refrigeration systems	<ul style="list-style-type: none">a) Component parts and their functions; open, semihermetic and hermetic, rotary, and centrifugal units; application of refrigeration systems – domestic, commercial, and industrial;b) maintenance and repair of systems; compression systems; fluid flow; vaporization; basic electrical circuitry applicable to refrigeration systems, including all control systems; manifolds and gauges.
28. Charging a system	<ul style="list-style-type: none">a) Proper techniques of evacuation and charging; leak-detection methods; gauge manifold – installing gauges, measuring pressure; vacuum pumps; purpose, types, and properties of refrigerants; safe handling of refrigerants.
29. Plumbing systems and fixtures	<ul style="list-style-type: none">a) General knowledge of hot- and cold-water supply; operation of and simple repairs on valves, water closets (toilet bowl and tank);b) installing drains and waste lines; valves, water closets (toilet bowl and tank); water heaters; water softeners;c) sink and bath fixtures; washing machines; humidifiers; fountains; showers; types and purposes of basins, baths, drains, and other types of plumbing systems; cleaning and maintaining fountains, sinks, drains, water closets, urinals; germicidal cleaning of washrooms, showers, and sauna baths.
30. Drainage systems	<ul style="list-style-type: none">a) Drainage systems – types, sizes, and purposes; locations and functions; health restrictions;b) drain plan; sanitary drains; storm drains; foundation drains; building traps; clean-outs; soil and waste stacks and stack footings; offsets;c) sewage disposal plants; septic tanks; drain clearing equipment; traps and vents.

31. Venting	<ul style="list-style-type: none">a) Types, sizes, and purposes; syphonage; back pressure; importance of venting to health;b) advantages of continuous waste vent; fittings; height of branch connections; sizing; distance from trap inlet to vent; maximum grade; approved materials.
32. Cleaning processes	<ul style="list-style-type: none">a) Types and applications of dusters, mops, brooms, brushes, abrasive pads, sweeping compounds; cleaning chemicals and their uses; dust control; damp and wet mopping;b) scrubbing and stripping floors; spray buffing; finishing floors; cleaning washrooms; cleaning glass; collecting waste;c) detergents and soaps, stripping chemicals, germicides; cleaning walls – methods for various types (wood, painted, block, ceramic); vacuum cleaning – methods (wet and dry) for different applications; cleaning drapes, floors, rugs, and furniture;d) chalkboards – types, break-in, cleaning methods;e) waxing methods and wax mixtures; cleaning compounds; using and caring for cleaning equipment; cleaning problems and their treatments.
33. Cleaning washrooms	<ul style="list-style-type: none">a) Maintaining washroom areas – fountains, sinks, drains, toilets, urinals, showers, and saunas; germicides for walls, cubicles, floors, pool decks, and fixtures.
34. Window and glass cleaning and cutting	<ul style="list-style-type: none">a) Types of glass; window and glass cleaning methods – chemicals, tools, inside and outside glass, high and low glass;b) glass-cutting tools and methods; glazing a window.
35. Waste collection	<ul style="list-style-type: none">a) Garbage disposal systems – incinerators, compactors, outside waste removal; tools and equipment;b) cleaning and maintaining equipment; health and sanitary regulations.
36. Furniture care	<ul style="list-style-type: none">a) Types of furniture – cloth-covered, metal, wood, painted; cleaning upholstery with chemicals; repairing furniture joints; refinishing and maintaining wood and metal;b) hanging pictures.

37. General maintenance (equipment)

- a) Landscape maintenance – lawn mowers, sweepers, blowers;
- b) maintenance of mechanical systems – waste compactors, incinerators, fans, motors, lubricating systems; air compressors – types, applications, checking, blowdown, oil level, high pressure, low pressure; boilers – types, main parts, fuels, inspection requirements, log, blowdown, venting domestic water, thermostats, oil filters, safety valves, smoke indicators, expansion tanks, emergency routines; pumps – types, applications, checking, packing, lubricating, and maintaining;
- c) scaffolds – types, uses, erection, safety measures, safety equipment;
- d) maintenance of cleaning equipment and tools – vacuum cleaners, floor machines (mops, brushes, etc.);
- e) maintenance of swimming pools; mechanical maintenance – conveyors, hoists; bearings, seals; drives, clutches, and couplings; hydraulic and pneumatic systems; farm equipment (maintenance and repair).

38. General maintenance (custodial)

- a) Preventive maintenance; establishing job routines; rug maintenance – cleaning (with vacuum, shampoo, steam, water, dry foam), testing for colourfast, testing for types of fabric, spotting, minor repairs;
- b) schedules and scheduling procedure; establishing job routines; flag rules; cutting grass; sweeping driveways and walkways;
- c) removing snow;
- d) lawns and gardens; ice control; parking lot markings, curbing;
- e) caring for and using vacuum cleaners (including wet-pick-up vacuums); repairing leaky taps, cleaning drains; adjusting door closers; caring for and using floor maintainers; waxing and polishing various floor surfaces; washing and cleaning venetian blinds; cleaning upholstery; supervising a building; parking lot marking; ongoing maintenance of outdoor recreational sport facilities (e.g., tennis courts) and driveways.

39. Work and energy

- a) Measurement; input and output; the idea of efficiency; conservation of energy; the rate of doing work; solids, liquids, gases – density and pressure.

40. Basics for painting	<ul style="list-style-type: none">a) Using materials, tools, and equipment; preparing surfaces; selecting and preparing coatings; application and drying times of various coatings;b) special coatings;c) types of spraying units – standard (compressed air), hydraulic (airless), electrostatic; spraying techniques.
41. Sign and poster making	<ul style="list-style-type: none">a) Layout and basic sign painting; types and uses of sign writers' brushes; designing, cutting, and using stencils;b) sign writing on glass; using gold and silver leaf;c) types of lettering; using pens for posters.
42. Preparation, priming, and finishing	<ul style="list-style-type: none">a) Treating concrete, stone, and metal surfaces;b) priming, undercoating, and finishing wood and plaster surfaces; treating interior and exterior wooden surfaces (new and previously painted).
43. Interior and exterior decorating	<ul style="list-style-type: none">a) Aesthetics, colour theory, light theory, and shadow; the design elements; colour harmony and room finishes; absorptive qualities, moisture content, the moisture meter; pointing and stopping materials and methods; elementary co-ordination;b) mixing and matching colours.
44. Weathering and surface deterioration	<ul style="list-style-type: none">a) Paint defects; identification of deterioration in surface finishes; resurfacing paint-coated surfaces;b) removing paint from old surfaces;c) corrosion treatment; heat effects on paint; causes of peeling, scaling, and blistering.
45. Wall coverings	<ul style="list-style-type: none">a) Methods of stripping wallpaper; wall-papering techniques; types, design, and quality of wall coverings; calculating surface areas to be covered – rectangles, circles, triangles, cylinders; roll sizes – metric and imperial;b) special papers; special adhesives.
46. Quantity production	<ul style="list-style-type: none">a) Designing and using jigs and fixtures for multiple cutting of duplicate parts.
47. Shop computers	<ul style="list-style-type: none">a) Information storage and retrieval; remedial work and testing; inventory control; source of supplies; sequential planning of operations; job costing; recording amounts of materials used.

48. Pipe and tubing materials	a) Types, sizes, and applications of soft and hard copper and plastic tubing; methods of joining and forming; fittings for various pipe and tubing systems.
49. Physics of heat	a) Definition of heat; heat flow; heat transfer; convection, conduction, radiation; conversion of heat energy; insulation; temperature measurement.
50. Fundamentals of electricity	a) Function of electricity applied to a refrigeration system; electrical test instruments – use and application; interpreting an electrical circuit diagram (for a refrigeration system); lighting maintenance – types of lights (incandescent, fluorescent, sodium, mercury), lamp replacement, re-lighting an area; electrical fixtures – cleaning, repairing; electrical safety – turning off power and lockout, testing for power; fuse box, circuit breakers; grounding; overload; the duplex plug; the light switch; electrical connections; connection cords, cord plugs; table and floor lamp maintenance.
51. Testing and measuring	a) Pressure, temperature, electrical, and linear measurements – types of instruments and methods of application; detecting faults in a system.
52. Fire control	a) Classes of fires; extinguishers; equipment control; evacuation; fire alarms.

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
4. Food Services Grouping	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	<u>Course</u>	<u>Div</u>	<u>Approved Course Levels</u>		<u>Course Code</u>
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Woodwork (Grades 9-12)

Masonry and Trowel Trades (Grades 9-12)

Heating, Refrigeration, and Air Conditioning (Grades 9-12)

Plumbing and Pipefitting (Grades 9-12)

Building and Equipment Maintenance (Grades 9-12)

Custodial Services (Grades 9-12)

Painting and Decorating (Grades 9-12)

Curriculum Guideline

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*3. Electrical
Grouping*

Module 1, 1985



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Introduction to the Electrical Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, Part B, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. The ten subject groupings of Part B are listed in the Appendix of this document, along with the subjects and authorized courses. Each subject grouping in Part B is to be treated as a separate component.

Part A provides essential background for the planning of all courses in technological studies. Course planning must reflect, in particular, the principles outlined in these sections of Part A: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including evaluation of student achievement and program).

Subject grouping

This document is designated as Module 1 for the electrical curriculum component. Additional modules for this grouping will appear in the future when revisions and additions have been completed.

The following subjects are included in this grouping: applied electricity, electrical technology, electronics, electrical appliance repair, and computer technology. The authority to establish courses is provided in each of the five subjects.

While subjects in this grouping may also relate to the construction, manufacturing, and service industries, they have much in common with each other—particularly in Grades 9 and 10. Each subject embraces content that is unique, as well as content of a basic conceptual nature that is common to the grouping. For career-planning purposes, students taking courses under any one of these subjects should gain through their studies some insight into the other subjects of the grouping.

Students have a variety of reasons for enrolling in courses derived from this component of the guideline. For some, enrolment may eventually lead to a career as an appliance repairperson. For others, it may be the first step

towards an apprenticeship as an industrial, construction, or maintenance electrician. For some students, it may be an introduction to an area of technology they can pursue in Senior Division courses and possibly at the post-secondary level. Finally, many students may study the subjects of this grouping to develop a level of technical competence for personal use and problem solving in the electrical and electronics fields.

Subject sections

Separate sections are provided in each subject for planning basic, general, and/or advanced level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must also include the skills and knowledge outlined as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, whether in one course or the sequence of courses for the division.

While in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will differ at the varying levels. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific objectives. The list of core aims for courses at the basic, general, and advanced levels is intended to serve as a guide for these objectives. The nature of the core aims is such that teachers can identify and set the learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the core aims, learning objectives, and core content specify the core learning for a course. Any remaining course time can be

structured to amplify the core learning and/or enrich the course(s) with optional content. Additional topics, appropriate to particular objectives and course themes, may be selected from "Course Content for the Electrical Grouping", at the end of this module, or from course content listed at the end of any other module in Part B.

Course content (charts)

Charts are used to specify the core content for each level of difficulty, subject, and division of the electrical grouping. The letters on the charts represent the subunits listed in "Course Content for the Electrical Grouping". This content is composed of numbered units, each made up of topics. The topics are structured into subunits designated *a*, *b*, *c*, etc., for easy reference to the charts.

Chart 3.1.5 provides a summary of content for the electrical grouping with the core content indicated for all courses. This summary chart is intended to provide a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Electrical Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the construction component may be incorporated into the electrical appliance repair program if refrigeration is selected as an appropriate theme.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in electricity and electronics, the types of components, equipment, and laboratory challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, design problems, working materials, and tools associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the technology.

Bi-level and bi-grade classes

Bi-level and/or bi-grade classes that combine groups of students taking courses at different levels of difficulty (e.g., electronics, general and advanced levels) or at different grade levels (e.g., electrical appliance repair in Grades 11 and 12) will become more common. While the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some challenges to the teacher, these classes provide a means of accommodating small numbers of students in different courses and increased opportunities for meeting their needs.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at each level. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons given by the teacher to either level should be short, have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve more students in self-directed work and research projects of a limited length. Group activity in the simulated work environment can both reinforce subject content for the students involved and develop social skills such as co-operation and responsibility.

Because of wide differences in student ability in bi-level classes, special consideration must be given to the assessment of students. Test materials need to be designed for students who have difficulty in reading and writing. Generally care must be taken to ensure that the test materials are at a reading level that is appropriate to the students' ability. In writing their answers, students should be encouraged to use proper sentences but they should feel free to use language that is natural to them. Questions and answers that involve drawings and diagrams are effective assessment instruments in technological studies. Short oral tests and frequent examination of students' progress on projects provide valid methods of assessment.*

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. Confidence

gained through these opportunities is particularly important to young people who can expect to face a working life characterized by changing technology and the constant need to update their skill and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Although students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

* Additional suggestions relating to evaluation are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Applied Electricity

Intermediate Division

(Grades 9 and 10)

Intermediate Division courses in applied electricity provide students with the exploratory experiences, skills, and knowledge that will prepare them for Senior Division courses in electrical theory and test, electrical installation and maintenance, or elements of electrical technology. This sequence of courses offers a variety of interesting career options in addition to apprenticeship, ranging from industrial control and maintenance to postsecondary opportunities in electrical technology and engineering.

Courses in applied electricity can also provide useful background knowledge and skills for a

variety of occupations related to the industry, such as sales and marketing; estimating; and developing, servicing, and operating specialized machines and equipment.

Courses in applied electricity are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 3.1.1 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow. The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 3.1.1
Core Content for
Applied Electricity
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content* for Courses		
	Basic	General	Advanced
1. Safety	a	a	a
2. Tools	a	a	a
3. Sources and characteristics of electricity; electrical units	ae	abd	abcde
6. Electrical connections	ab	ab	ab
7. Simple, series, and parallel circuits	ab	ab	ac
8. Ohm's Law	a	ab	c
9. Circuit resistance, resistors, and conductor sizes	a	a	ab
10. Magnetism; electromagnetism	a	ab	ab
11. Cells and storage devices	a		
12. Circuit protection devices	a	ab	ab
13. Electrical energy and power	a	b	bc
14. Electrical measuring instruments	a	a	ab
15. Types of electric current	a	a	b
17. Signal systems	a	a	a
18. Non-metallic sheathed-cable installation	ab	ab	a
22. Types of conductors and appliance cords	a	a	
24. Lighting equipment	a	b	
46. Perspectives on employment	abc	acd	acd

*See "Course Content for the Electrical Grouping", beginning on page 26, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TEA1B for Grade 9 and TEA2B for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop a healthy attitude towards good work habits, critically evaluate the results of their own work, and develop pride in the quality of their work;
- develop an awareness of proper safety procedures and respect for energized electrical circuits;
- develop proficiency in the selection and use of appropriate hand and power tools;
- develop proficiency in the use of basic test equipment and an understanding of its limitations;
- install, according to Ontario Safety Code, lighting circuits and equipment;
- acquire a perspective on the electrical industry and knowledge of the various career opportunities within it;
- develop an attitude of respect and co-operation towards their peers and teachers/supervisors.

Suggestions for Teachers

Basic level courses in Grades 9 and 10 should stress the development of basic skills such as measuring, simple arithmetic, connections, and neatness in practical work. Every effort should be made to integrate the students' academic program with their technical studies.

Students working at the basic level of difficulty will benefit from special emphasis on practical work. Individual and small-group work is especially important in assisting the learning process. The teacher will have to use his or her knowledge of the capabilities and interests of individual students in determining the extent to which special considerations need to be applied in order to provide experiences from which students can achieve success and self-satisfaction. Small-group activities provide students with the opportunity to assist one another and to develop a variety of social skills that will benefit them in future work situations.

Students at the basic level particularly enjoy being involved in practical activities, and therefore a very limited amount of time should be spent in lecturing. Developing a high level of student enthusiasm is the key to a successful program.

The teacher will probably find it vital to prepare his or her own instruction sheets using words and language structure appropriate to the basic level. If carefully thought out, such materials can also be directed towards improving language usage and spelling. Students should be given the opportunities to put ideas and concepts into their own words and to give answers in sentence form.

The evaluation of the student should include a wide variety of factors. Tests should be short and should deal with a limited number of topics. Oral testing should frequently be used. The results of a student's practical work are often the best indicator of the student's progress. Attendance, punctuality, preparation for class (having books, written material, etc.), co-operation, and leadership are all important skills that should be considered in the evaluation process.

Courses that are planned to prepare students to enter electrical construction or industrial maintenance trades should provide a balance between the practical skills and the theoretical knowledge necessary to continue learning in this subject field. Students taking these courses should become well informed concerning apprenticeship requirements, local job opportunities, the procedures for securing an

apprenticeship through the admitting committee of a union local, and avenues for further education.

Students should be informed of the career opportunities in the electrical field. Brief presentations by former graduates about their own careers, as well as field trips, will stimulate student interest and provide insight into available careers.

In unit 1, attention should be given to safety on the job site, with special emphasis on safety attitudes and the precautions that must

become habitual when energized circuits are handled. Various organizations can provide useful resources concerning safety. St. John Ambulance and Red Cross personnel can demonstrate the proper method of artificial respiration. The Construction Safety Association and the Industrial Accident Prevention Association offer a wide range of resources.

At the basic level of difficulty, courses in applied electricity will require a fairly intensive treatment of the skills presented in units 6, 17, 18, and 24.

General Level

Course codes assigned to general level courses planned under this section will be TEA1G for Grade 9 and TEA2G for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop a healthy attitude towards good work habits, critically evaluate the results of their own work, and develop pride in the quality of their work;
- develop an awareness of the dependence of modern society on electrical energy and the environmental problems created by the various methods of generating electrical energy;
- develop an awareness of proper safety procedures and respect for energized electrical circuits;

- develop proficiency in the selection and use of hand and power tools;
- develop their ability to construct, analyse, and test electrical circuits from schematic diagrams;
- develop proficiency in the use of basic test equipment;
- develop an attitude of respect and co-operation towards their peers and supervisors;
- install, according to Ontario Safety Code, lighting circuits and equipment;
- acquire a perspective on the electrical industry and knowledge of the various career opportunities within it, particularly electrical apprenticeships.

Suggestions for Teachers

Depending on local requirements, the total time of courses offered under this section will vary from a minimum of approximately 55 hours to a maximum of 220 hours over a two-year period. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, practical skills, and residential wiring materials and methods.

A few of the students taking courses at this level may go on to postsecondary education;

however, it is expected that most will enter the labour market upon leaving secondary school. Every effort should be made to foster good work habits and a positive attitude towards the requirements of the workplace. Attendance, punctuality, preparation for class (having books, writing materials, etc.), effort, and responsibility in meeting deadlines should be encouraged and should form a significant part of the evaluation scheme.

Students should be encouraged to become aware of developments and issues related to electrical energy. Teachers can, for instance,

have students maintain individual or group scrapbooks of newspaper and periodical items to be used as bases for class discussions.

Teachers should keep in mind that students completing courses offered under this section will in all likelihood be taking another two years of secondary school education. A major aim of the courses should be to stimulate student interest in the study of electricity and in careers in the electrical field. Theory lessons should be complemented by interesting and relevant practical projects.

If time permits, courses offered under this section should include an introduction to blue-print reading, with particular emphasis on the common electrical symbols used in architectural plans. This additional content can be developed from units listed at the end of Module 1 for the graphics grouping.

Students taking these courses should become well informed concerning apprenticeship requirements, local job opportunities, the procedures for securing an apprenticeship through

the admitting committee of a union local, and the programs in the electrical field that are offered by postsecondary institutions.

In unit 1, attention should be given to safety on the job site, with special emphasis on safety attitudes and the precautions that must become habitual when energized circuits are handled. Outside organizations such as St. John Ambulance and Red Cross will often provide, when requested, demonstrations of the application of artificial respiration.

The choice of additional course content will vary according to course objectives and resources. For courses at the general level of difficulty, course content from units 19, 20, 23, and 29 can reinforce the practical aspects of the courses, while units 5 and 15 can complement the theoretical parts.

Suggestions provided in the preceding section for basic level courses can in many cases be adapted to general level courses.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TEA1A for Grade 9 and TEA2A for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop an appreciation of the significant relationship of electricity to the other fields of study;
- develop a healthy attitude towards good work habits, critically evaluate the results of their own work, and develop pride in the quality of their work;
- develop an awareness of the dependence of modern society on electrical energy and an appreciation of the environmental problems created by its production;
- develop an awareness of proper safety procedures and respect for energized electrical circuits;
- develop proficiency in the selection and use of appropriate hand and power tools;
- develop their ability to construct, analyse, and test electrical circuits and networks utilizing standard components and equipment;
- develop proficiency in the selection and use of test equipment and an understanding of its limitations;
- install, according to Ontario Safety Code, residential electrical circuits and equipment;
- develop an attitude of respect and co-operation towards peers and supervisors;
- develop the ability to design circuits from a word statement of the circuit functions.

Suggestions for Teachers

Depending on local requirements, the total time of courses offered under this section will vary from a minimum of approximately 55 hours to a maximum of 220 hours over a two-year period. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, circuit theory, and practical skills such as the use of meters and soldering techniques.

It is expected that most of the students taking courses at this level are planning to attend college or university upon graduation from secondary school. They should become well informed about the opportunities for postsecondary education in the electrical field and about the careers that such studies lead to. They should also be made aware of the academic demands of postsecondary education.

Teachers should make every effort to relate the material in this course to the students' studies in other subjects—particularly mathematics and science. The application of mathematical skills to substituting in formulas, solving equations, and problem solving should be stressed. When dealing with electrical quantities, the use of metric prefixes to express large or small quantities should be stressed.

Students should be given opportunities to put ideas and concepts into their own words and to give answers in sentence form. Such opportunities can be provided through assignments such as project reports and brief research essays.

When core unit 7 is covered, it is suggested that, in addition to the usual treatment, an introduction to logic circuitry be included. The

basic AND, OR logic characteristics of series and parallel connected switches could be covered, as well as AND - OR combinations.

Students taking these courses may not have an opportunity to take electronics courses until they are in the Senior Division. Every effort should be made to make students aware of the close relationship between electricity and electronics and not to treat them as mutually exclusive subjects. The relationship between the subjects can be reinforced by practical projects involving electronics.

Where time permits, courses may include additional topics selected from "Course Content for the Electrical Grouping" beginning on page 26. For courses at the advanced level of difficulty, additional topics from units 17, 22, and 23 can reinforce the practical aspects of the courses, while units 5, 31, 33, and 34 can complement the theoretical parts. For gifted students the course content can be enriched by the addition of selected topics and projects related to units 36, 37, and 38.

Students should be encouraged to organize their study schedule and to undertake self-directed studies. Long-term assignments and reports can be used effectively for this purpose. The marks earned should be a significant factor in the evaluation scheme. Penalties should be assessed for late submission.

In unit 1, attention should be given to safety when handling electrical equipment in the shop or at home, and particularly to spotting and eliminating potential electrical hazards.

Electrical Technology

Senior Division

(Grades 11 and 12)

Courses in electrical technology for the Senior Division, Grades 11 and 12, may be offered at basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the curriculum guideline *Elements of Electrical Technology S.27B, 1969* and *Supplement, 1969*.

When courses are being planned for the Senior Division, additional topics may be included from the units listed under "Course Content for the Electrical Grouping" or from any of the other subject groupings of Part B of *Technological Studies, Intermediate and Senior Divisions, 1985*.

Courses planned in electrical technology can prepare students for postsecondary training in the electrical field and for entry into the trades of industrial electrician, construction and maintenance electrician, and associated occupations.

At the basic level, courses may be structured to relate closely to electrical aspects of other technical courses. By this means, students may be given some understanding of how electrical concepts are applied in a field such as motive power or construction, where their major interest may be focused.

At the general or advanced level, courses in electrical technology should be structured wherever possible as the major component of a school-related package. For students who plan to enter apprenticeship or continue in a

postsecondary electrical program, good achievement in science, mathematics, and English at the Grade 12 level is essential. Courses in these subjects, along with related electronics and drafting or blueprint reading, can be structured into the package over a two- or three-year period so that elements of the program are mutually reinforcing. The program should be planned so that the student can recognize the unity and relationships among the courses.

Courses offered at the advanced level should provide students with a broad mix of electrical knowledge and skills. Advanced level courses can be planned as a base on which university and college technology programs can build.

In many schools, it may be necessary for advanced level courses to be offered in a bi-level mode with general courses. In such cases, students at the advanced level should be able to handle many of the enrichment topics through independent study.

Courses planned for this subject area will be identified by the initial three letters TEY as the stem of the course code.

Electronics

Intermediate Division

(Grades 9 and 10)

The continuing growth of the microelectronics industry provides a wide variety of interesting career opportunities. To an increasing extent, computer and microprocessor technology allows the processing and transmission of information by electronic means. Microelectronics, when applied to the control of industrial processes and to the construction of commercial products, complements the trend in our economy towards both increased automation of manufacturing and more sophisticated personal services.

Intermediate Division courses in electronics will prepare students for Senior Division courses and develop awareness of postsecondary programs leading students to careers as engineers, technologists, or technicians. These careers can be related to engineering, manufacturing, marketing, or servicing in fields such as avionics, instrumentation, robotics, data processing, and telecommunications.

In addition to providing students with a perspective on technological careers within the electronics field, these courses can also provide valuable technical understanding. Students can develop skills and knowledge for their personal use through the selection, construction, and servicing of simple electronic products such as modules for a sound system, simple test instruments, and remote control devices (e.g., garage door openers).

Courses in electronics are authorized for Grades 9 and 10 at general and advanced levels of difficulty. Chart 3.1.2 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow. The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 3.1.2
Core Content for
Electronics
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content* for Courses	
	General	Advanced
1. Safety	a	a
2. Tools	a	a
3. Sources and characteristics of electricity; electrical units	abcde	abcde
5. Conductors, semiconductors, and insulators	a	a
6. Electrical connections	b	b
7. Simple, series, and parallel circuits	ab	ac
8. Ohm's Law	ab	c
9. Circuit resistance, resistors, and conductor sizes	b	b
10. Magnetism; electromagnetism	abc	abcd
12. Circuit protection devices	a	ab
14. Electrical measuring instruments	a	ab
15. Types of electric current	b	b
31. Transformers	a	a
32. Signal sources	a	ab
33. Inductance		a
34. Capacitance		a

Content Units	Core Content* for Courses	
	General	Advanced
36. Printed circuits	a	a
37. Semiconductors	a	ab
38. AC power supplies		a
43. Schematics and wiring diagrams		b
44. Digital concepts	a	a
46. Perspectives on employment	acd	acd

*See "Course Content for the Electrical Grouping", beginning on page 26, for description of the subunits a, b, c, etc.

General Level

Course codes assigned to general level courses planned under this section will be TEL1G for Grade 9 and TEL2G for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop an attitude of respect and co-operation towards their peers and supervisors;
- develop the ability to follow oral instructions and to understand and implement written instructions;
- develop an increasing awareness of self and of personal strengths and weaknesses;
- use test equipment to evaluate and find sources of trouble in faulty circuits;
- develop an overall awareness of proper safety procedures;
- develop the ability to use appropriate hand and power tools;
- relate basic electronic theory to practical laboratory and shop experiences;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop an awareness of the changing technological world as seen in the use of electronics in such fields as industrial control, transportation, communications, computers, and entertainment;
- acquire knowledge of the many career opportunities in electronics and of the various postsecondary training routes available to prepare for them.

Suggestions for Teachers

General level courses in electronics should provide exploratory experiences for careers, employment, or further education in the colleges of applied arts and technology or other non-university educational institutions. The core aims and the depth of treatment of the content should reflect this requirement. Emphasis should be placed on basic practical skills required by a technician or technologist for performance on the job. Practical activities

that relate to this skill development should take up a minimum of 60 per cent of the course time.

Certain of the core topics lend themselves directly to practical applications. These include topics in units 1, 2, 6, 9, 14, 36, and 43. The rest of the topics can be incorporated into construction projects. For example, students might design and build a simple 9-volt power supply circuit suitable for use with electronic

devices such as small radios, cassette recorders, calculators, and electronic games. This project could include the theory on transformers and AC power supplies (units 31 and 38) and could be used to reinforce the theory of several other topics in units 8, 9, and 12.

A large variety of electronics magazines are available that contain many good projects. Parts for such projects are readily available at low prices through a number of local suppliers and mail order houses.

Whenever possible, teachers should try to relate the course content to one of the newer technologies, such as computers. A small example of this would be to discuss, when teaching power supplies, the importance of voltage regulation as it pertains to computers. The computer can be used as an excellent teaching aid or as a diagnostic tool, and students should be made aware of its uses.

An important skill associated with electronics is calculating the values within a circuit using mathematical formulas. These formulas should be considered as tools only, and not as ends in themselves. The use of calculators should be encouraged to remove the drudgery of mathematical manipulations and to reduce the time involved.

Teachers should use the concept of "language across the curriculum" to improve the communications skills of their students. They can do this by assigning written work and oral presentations of technical reports. The language as well as the technical content of these items should be evaluated.

Teachers should attempt to introduce information on career opportunities whenever possible, using newspaper or magazine articles, films and filmstrips, and career speakers from industry.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TEL1A for Grade 9 and TEL2A for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop an appreciation of the necessary relationship of electricity to the other fields of study;
- develop the capability for clear and creative thinking;
- develop an attitude of respect and co-operation towards peers and supervisors;
- develop an awareness of the changing technological world as seen in the use of electronics in such fields as industrial control, transportation, communications, computers, and entertainment;
- develop the ability to follow oral instructions and to understand and implement written instructions;

- develop an overall awareness of proper safety procedures;
- develop dexterity in the manipulation of hand and power tools as well as diagnostic test equipment;
- use test equipment to evaluate and find sources of trouble in faulty circuits;
- relate basic electronic theory to practical laboratory experiences;
- acquire knowledge of the many career opportunities in electronics and of the various postsecondary training routes available to prepare for them.

Suggestions for Teachers

Advanced level courses should focus on the development of academic skills and prepare students for entry into university and other postsecondary institutions. In technological studies, advanced level courses should be set up with an emphasis on developing thinking skills related to practical problem solving. Acquisition of theoretical knowledge and concepts should make up approximately 60 per cent of the course time.

The course should be analytical in nature so that students become fully aware, not only of how components and circuits operate, but also of why they behave the way they do. One approach would be to have students consider all the factors that affect a particular property such as capacitance. Once students are aware of these factors, they can consider the effects of changing them. To carry this a step further, once students know all the characteristics of capacitance, they can understand how capacitors affect the operation of a circuit.

The practical aspect of the course should be planned to help the students understand the theory. This aim can be met through the use of projects (e.g., small amplifiers and alarm circuits), which the student breadboards. When the circuit has been completed, the student can run a series of tests and measurements on it to determine its operating characteristics. Finally, the student can determine the effect of altering certain components in the circuit. There are a large number of electronics magazines available that contain many good projects. Parts are readily available at low prices through a number of local suppliers and mail order houses.

Teachers should try whenever possible to relate the course content to one of the newer technologies, such as computers. For instance, they might discuss the importance of voltage regulation and the use of capacitors for decoupling in computers. The computer can be used as an excellent teaching aid or as a diagnostic tool, and students should be made aware of its uses. The computer can be used to calculate circuit values, plot graphs, and simulate circuit operation. Also, it has great potential as a motivator.

Students should be encouraged to explore the course content on their own. This exploration can be facilitated through the use of written research assignments and oral presentations of technical reports. This approach works especially well with gifted students and those who show a particular interest in the course. To incorporate the concept of "language across the curriculum", evaluation of these assignments and reports should consider the student's use of language as well as the technical content.

Teachers should attempt to introduce information on career opportunities whenever possible, through newspaper or magazine articles, films and filmstrips, and career speakers from industry. School guidance counsellors are often a useful resource.

Electronics

Senior Division

(Grades 11 and 12)

Electronics courses for the Senior Division, Grades 11 and 12, may be offered at general and advanced levels of difficulty in one or more of three specialty areas: communications, industrial control, and computer electronics. Planning for these courses will continue to be based on the curriculum guideline *Elements of Electrical Technology S.27B*, 1969 and *Supplement*, 1969.

When courses are planned for the Senior Division, additional topics may be included from the units listed under "Course Content for the Electrical Grouping" (at the end of this module) or from any of the subject groupings in Part B of the technological studies guideline.

These courses should provide a balanced preparatory base of theoretical and practical studies appropriate to further studies at the postsecondary level. In addition, the practical studies should provide students with the technological competence they need to remain conversant with the technology as it changes, to investigate confidently new applications they encounter during their work and leisure activities, and to use new applications with ease.

Communications technology. Courses with this focus will provide an overview of audio and video technologies with opportunities for some in-depth experience involving major components of typical systems. Students who successfully complete this course will be able to understand the various aspects of transmission and reception of signals through various conducting media, to describe the transduction processes involved in various systems, to identify the significant design features of various systems, and to use testing and other equipment to identify faults and make simple repairs and modifications to various systems.

Industrial control technology. Courses with this focus will investigate the sensing and control of the physical parameters involved in various processes. These processes may range from industrial production processes to home entertainment systems. Students should acquire insights into basic electronic (analog) circuits; digital electronics, and especially the use of logic elements, chips, and devices; and the analysis of, and synthesis of solutions to, problems involving the electronic control of a process.

Computer electronics. Digital electronics will be the major topic under this theme. The investigation and application of digital subsystems and other units in circuits associated with the microcomputer will comprise the major activity of these courses. Where computer electronics is the major theme, students should first receive an introduction to analog electronics. On completion of the computer electronics courses in Grade 11, students should be able to handle the Grade 12 computer technology course (advanced) outlined in the *Computer Studies, Intermediate and Senior Divisions*, 1983 guideline or be able in a Grade 12 electronics course to use a microprocessor chip in the construction of a simple microcomputer.

Courses planned for electronics in the Senior Division will be identified by the initial three letters TEL as the stem of the course code.

Electrical Appliance Repair

Intermediate Division

(Grades 9 and 10)

Modern men and women depend on labour-saving devices for comfort, efficiency, and good health. Electrical appliances save many hours of manual work in homes, places of business, and industry. They contribute to our high living standard and quality of life. Both small portable and large fixed appliances have to be installed, maintained, and repaired by qualified technicians. The ability to do this work safely and efficiently requires training and practice. The variety of work and the responsibilities involved make the career of appliance repair interesting and challenging.

Intermediate Division courses in electrical appliance repair will focus mainly on the electrical aspects of appliance repair. Students who continue with Senior Division courses that are registered in the provincial Linkage program will have the opportunity to achieve a provincially recognized standing in one or more of

five related training modules (*Electricity I, Single Phase Motors, Blueprint Reading – Electrical Devices, Communication – Customer Relations, and Refrigeration for Domestic Units*) in the provincial training program for major appliance service technicians. Information on this program is available from the directors of the regional offices of the Ministry of Education.

Courses in electrical appliance repair are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 3.1.3 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow. The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 3.1.3
Core Content for
Electrical Appliance
Repair
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content* for Courses	
	Basic	General
1. Safety	a	a
2. Tools	a	a
3. Sources and characteristics of electricity; electrical units	ab	ab
5. Conductors, semiconductors, and insulators		a
6. Electrical connections	ab	ab
7. Simple, series, and parallel circuits	a	ab
8. Ohm's Law	a	a
10. Magnetism; electromagnetism	a	a
12. Circuit protection devices	a	a
14. Electrical measuring instruments	a	a
17. Signal systems		a
23. Building test equipment		a
36. Printed circuits		a
46. Perspectives on employment	abc	abc

*See "Course Content for the Electrical Grouping", beginning on page 26, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TER1B for Grade 9 and TER2B for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in their work on repair tasks and confidence in their ability to work responsibly on their own and in co-operation with others;
- acquire safe personal working habits and a positive attitude towards the safety of others;
- develop manipulative dexterity (motor skills) and skills in the use of hand and power tools and of equipment commonly used in appliance repair;
- develop practical skills in the electrical and mechanical fields;
- recognize various properties of materials and understand the reasons for their application in appliance products;
- acquire knowledge and understanding of the ways to proceed in the solution of problems;
- prepare, through practical training, for specific occupational goals.

Suggestions for Teachers

Basic level courses in electrical appliance repair for the Intermediate Division should stress the development of basic skills such as measuring, simple arithmetic, connections, and neatness in practical work. Courses should be weighted heavily towards activities involving practical work. The student working at this level needs to be encouraged by numerous successful experiences.

Individualization of basic level courses may challenge the teacher's patience but will contribute to students' success. Far more productive and less frustrating than a long lesson is a series of mini-lessons, both individual and small-group, of five to ten minutes' duration interspersed with periods of applied work. Students who work quickly might be called upon to teach others who are in difficulty. This sort of co-operation and small-group activity helps the growth of social skills that are vital in getting a job, holding it, and getting promoted.

The teacher will probably find it vital to prepare his or her own instruction sheets using words and language structure appropriate to the basic level. If carefully thought out, such materials can also be directed towards improving language usage and spelling.

Students in the introductory years of appliance repair should be given the opportunity to trouble-shoot and repair small appliances such as electric kettles and toasters. There is a wealth of broken appliances available for the asking from the community. A written appeal sent home with students should provide an ample supply.

Students should be introduced initially to components such as switches, lamps, resistors, and rheostats through simple DC circuit boards, which facilitate electrical measurements. These can be used to help students to better understand the function of individual components and to detect simulated problems in the circuit.

In addition to the electromagnetic properties of materials used in appliance components (e.g., conductors, insulators, and magnetic materials), other physical and chemical properties of the materials (e.g., those related to heat, forces, or common household chemicals) may be studied in science classes.

Special safety rules relating to specific components, operations, or situations should be introduced at appropriate times. Only general shop safety should be of concern at the beginning of the course. As the course proceeds,

students should gain an appreciation for the overall safety of the individual and the group through the development of safe work habits and attitudes.

In courses that are based on this subject and registered in the appliance repair Linkage program, it will be found that the core learning

can include most of the terminal performance objectives listed in the training profile module *Electricity I*. The remaining objectives in the *Electricity I* module are covered in optional course content units (e.g., unit 15) listed at the end of this module.

General Level

Course codes assigned to general level courses planned under this section will be TER1G for Grade 9 and TER2G for Grade 10.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in their work on repair tasks and confidence in their ability to work responsibly on their own and in co-operation with others;
- acquire safe personal working habits and a positive attitude towards the safety of others;
- develop manipulative dexterity, knowledge, and skills in the use of hand tools, power tools, and other equipment commonly used in appliance repair;

- recognize various properties of materials and functions of components and understand the reasons for their application in appliance products;
- learn to solve problems by analysing them, gathering appropriate data, and implementing solutions;
- prepare, through practical training, for specific educational goals, including further education at college level.

Suggestions for Teachers

Exciting the interest and imagination of the students is of major importance for effective problem solving in electrical appliance repair work. Some demonstration lessons involving aspects such as circuit protection, magnetism, use of test equipment, and switching of a neutral wire might stimulate this. Although emphasis should be placed on application, students also need to learn the value of theory. By tying theoretical discussions very closely to practical applications, the teacher can demonstrate the importance of theory not only as a means of understanding electrical phenomena but also as a tool for solving practical problems. Solid state controls are increasingly common in appliances, and a basic introduction to the printed circuit is both interesting and useful.

Special safety rules relating to specific components, operations, or situations should be introduced when these circumstances arise. Only general shop safety should be of concern at the beginning of the course. As the course proceeds, students should gain an appreciation for the overall safety of the individual and the group and develop safe work habits and attitudes.

In courses that are based on this subject and registered in the appliance repair Linkage program, it will be found that the core learning can include most of the terminal performance objectives listed in the training profile module *Electricity I*. The remaining objectives in the *Electricity I* module are covered in optional course content units (e.g., unit 15) listed at the end of this module.

Electrical Appliance Repair

Senior Division

(Grades 11 and 12)

Courses in the Senior Division focus mainly on the electrical aspects of appliance repair.

The performance objectives outlined in the five training profiles (modules) that make up the Linkage program for appliance repair can serve as a useful curriculum base for Senior Division courses in this subject. The performance objectives outlined in the modules

Electricity I, Blueprint Reading, Single Phase Motors, and Communication (Customer Relations) can be readily included in a series of practical (appliance-related) projects rather than treated in isolation. The subjects of the individual modules can be considered as parallel themes that are developed through the series of courses that make up the secondary school program. The successful achievement,

by students officially registered in this Linkage program, of objectives listed in the profiles can facilitate their earning training credits in the modular training program for "major appliance service technicians". Information on this program is available from the directors of the regional offices of the Ministry of Education.

Courses in electrical appliance repair are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 3.1.4 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow. The courses may vary in time allotment and may be designed to offer up to 330 hours of in-school work each year.

Chart 3.1.4
Core Content for
Electrical
Appliance Repair
Senior Division
(Grades 11 and 12)

Content Units	Core Content* for Courses	
	Basic	General
1. Safety	a	a
2. Tools	a	a
4. Management studies		a
8. Ohm's Law	ab	abc
12. Circuit protection devices	a	a
13. Electrical energy and power		a
14. Electrical measuring instruments	a	a
16. Canadian Electrical Code and Ontario Safety Code	a	a
22. Types of conductors and appliance cords	a	a
25. Electric heating application	a	ab
26. Electric motors	a	a
27. Use of service and parts catalogues	a	a
28. Customer reports, work orders, and billing procedures	a	ab
29. Service-entrance installation	a	ab
36. Printed circuits		a
43. Schematics and wiring diagrams		b

Content Units**Core Content* for Courses**

	<i>Basic</i>	<i>General</i>
45. Electromechanical devices in appliances		a
46. Perspectives on employment	abc	abc
47. Temperature controls	a	a
48. Fasteners	a	a

*See "Course Content for the Electrical Grouping", beginning on page 26, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TER3B for Grade 11 and TER4B for Grade 12.

Core Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in the quality of their work on repair tasks and confidence in their ability to work responsibly on their own and in co-operation with others;
- acquire safe personal working habits and a positive attitude towards the safety of others;
- develop manipulative dexterity (motor skills) and skills in the use of hand and power tools and of equipment commonly used in appliance repair;

- recognize various properties of materials and understand the reasons for their application in appliance products;
- acquire knowledge and understanding of the ways to proceed in the solution of problems;
- prepare, through practical training, for entry into industry and for further training and education.

Suggestions for Teachers

Continuing emphasis should be placed on developing self-confidence and good basic practical skills, a theme developed more fully in the suggestions for teachers of basic level courses in the Intermediate Division. Self-confidence can grow as students undertake appliance repair tasks in the non-threatening environments of their own homes. Skill is the product of extensive hands-on experience. It is important to provide students with the opportunity to trouble-shoot and to repair large appliances such as stoves, washers, and dryers. Teachers should make every effort to acquire from manufacturers up-to-date information on their appliances.

In order for students to acquire information on available routes to further training, they should have opportunities for co-operative work experience and career exploration in the appliance-servicing field as part of their Senior Division course work. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

Registration in the provincial Linkage program can provide a powerful incentive for students to stay in the course, to apply themselves, and to seek additional background and experiences.

In secondary school courses it is desirable to integrate the content of the Linkage training profiles into the course work. The performance objectives outlined in the modules *Electricity I*, *Blueprint Reading*, *Single Phase Motors*, and *Communication (Customer Relations)* can be readily supported through a series of practical (appliance-related) projects.

The content identified in the Linkage module *Refrigeration for Domestic Units* is also included under units in the list of course content

for the construction component of this technological studies guideline. Where the appliance repair course is offered in an electrical shop, the content for *Refrigeration for Domestic Units* can be developed as a theme in an associated heating, refrigeration, and air-conditioning course if such facilities are available in the school.

General Level

Course codes assigned to general level courses planned under this section will be TER3G for Grade 11 and TER4G for Grade 12.

Core Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe personal working habits and a positive attitude towards the safety of others both on and off the worksite;
- develop pride in the quality of their work and confidence in their ability to work responsibly on their own and with others;
- develop manipulative dexterity, knowledge, and skills in the use of hand tools, power tools, and other equipment commonly used in appliance repair;
- recognize various properties of materials and functions of components to understand the reasons for their application in appliance products;
- learn to solve problems by analysing them, gathering appropriate data, and implementing solutions;
- become aware of the requirements of on-the-job training or apprenticeship in this field and how to meet them and of the opportunities for further education, including courses at the college level.

Suggestions for Teachers

Drawing on the fundamentals taught in the Intermediate Division, the teacher can now start a more detailed study of appliance repair.

Students must have a good theoretical and practical understanding of the three-wire, 120/240-volt distribution system. This should be developed through practical experience involving, if possible, installation and simulated trouble-shooting of a system.

The mechanical aspects of appliance repairs should be explored in a planned way. Students should have the opportunity to observe the action of, and dismantle and reassemble, clutch, transmission, and pump mechanisms.

Understanding how electric motors operate and how to trouble-shoot them is of considerable importance in electrical appliance repair. Solid state controls, which are increasingly common, should be studied in terms of their theoretical operation and, if possible, investigated through practice in various trouble-shooting methods.

Students should also be made aware of the opportunities available in the areas of management and parts wholesaling. Tours of local service shops and industry can provide valuable awareness of career opportunities.

In secondary school courses, it is desirable to integrate the content of the Linkage training profiles into the course work. The performance objectives outlined in the modules *Electricity I*, *Blueprint Reading*, *Single Phase Motors*, and *Communication (Customer Relations)* can be readily supported through a variety of practical (appliance-related) projects of increasing sophistication and challenge.

The content identified in the module *Refrigeration for Domestic Units* is also included under units in the list of course content for the construction component of this guideline. Where the appliance repair course is offered in an electrical shop, the performance objectives identified in *Refrigeration for Domestic Units* can be developed as a theme in an associated heating, refrigeration, and air-conditioning course if such facilities are available in the school.

In order for students to acquire information on available routes to further training, they should have opportunities for co-operative work experience and career exploration in the appliance-servicing field as part of their Senior Division course work. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

Computer Technology

Senior Division

(Grades 11 and 12)

Courses in computer technology may be offered in technological studies at the general level in Grades 11 and 12 and at the advanced level in Grade 12. Planning for these courses will be based on the curriculum guideline *Computer Studies, Intermediate and Senior Divisions, 1983*. These courses will be identified by the initial three letters TEC as the stem of the course code.

In planning a computer technology program for the advanced level of difficulty, teachers should be aware that there are, in addition to courses outlined in the computer studies guideline, two closely related courses from technological studies. A computer electronics course planned for the advanced level of difficulty in Grade 11 can provide a desirable

background for the Grade 12 computer technology course. Further information on this electronics course option appears on page 15 of this document. The second related course is the OAC in computer technology (interfacing), outlined in Part C of this technological studies guideline.

Programs planned for the general level in computer technology can also include courses in computer electronics. In many schools, the Grade 11 computer electronics course can probably be offered most effectively as a bi-level class, for students at both general and advanced levels of difficulty.

Summary of Core Content for Courses in the Electrical Grouping

Chart 3.1.5

Content Units	Applied Electricity (Grades 9-10)			Electronics (Grades 9-10)		Electrical Appliance Repair (Grades 9-10) (Grades 11-12)			
	Basic	General	Advanced	General	Advanced	Basic	General	Basic	General
1. Safety	a	a	a	a	a	a	a	a	a
2. Tools	a	a	a	a	a	a	a	a	a
3. Sources and characteristics of electricity; electrical units	ae	abd	abcde	abcde	abcde	ab	ab		
4. Management studies									a
5. Conductors, semiconductors, and insulators				a	a		a		
6. Electrical connections	ab	ab	ab	b	b	ab	ab		
7. Simple, series, and parallel circuits	ab	ab	ac	ab	ac	a	ab		
8. Ohm's Law	a	ab	c	ab	c	a	a	ab	abc
9. Circuit resistance, resistors, and conductor sizes	a	a	ab	b	b				
10. Magnetism; electromagnetism	a	ab	ab	abc	abcd	a	a		
11. Cells and storage devices	a								
12. Circuit protection devices	a	ab	ab	a	ab	a	a	a	a
13. Electrical energy and power	a	b	bc						a
14. Electrical measuring instruments	a	a	ab	a	ab	a	a	a	a
15. Types of electric current	a	a	b	b	b				
16. Canadian Electrical Code and Ontario Safety Code								a	a
17. Signal systems	a	a	a				a		
18. Non-metallic sheathed-cable installation	ab	ab	a						
19. Armoured-cable installation									
20. Rigid and EMT conduit installation									
21. Electric heating and heat-loss calculations									
22. Types of conductors and appliance cords	a	a						a	a
23. Building test equipment							a		

Content Units	Applied Electricity (Grades 9-10)			Electronics (Grades 9-10)		Electrical Appliance Repair (Grades 11-12)			
	Basic	General	Advanced	General	Advanced	Basic	General	Basic	General
24. Lighting equipment	a	b							
25. Electric heating application								a	ab
26. Electric motors								a	a
27. Use of service and parts catalogues								a	a
28. Customer reports, work orders, and billing procedures								a	ab
29. Service-entrance installation								a	ab
30. Motors, generators, and controllers									
31. Transformers				a	a				
32. Signal sources				a	ab				
33. Inductance					a				
34. Capacitance					a				
35. Radio circuits									
36. Printed circuits				a	a		a		a
37. Semiconductors				a	ab				
38. AC power supplies					a				
39. Basic amplifiers and interstage coupling circuits									
40. Silicon-controlled rectifier (SCR)									
41. Kirchhoff's voltage and current laws									
42. Electronic test instruments									
43. Schematics and wiring diagrams					b				b
44. Digital concepts				a	a				
45. Electromechanical devices in appliances									a
46. Perspectives on employment	abc	acd	acd	acd	acd	abc	abc	abc	abc
47. Temperature controls								a	a
48. Fasteners								a	a

See "Course Content for the Electrical Grouping", beginning on page 26, for description of the subunits a, b, c, etc.

Course Content for the Electrical Grouping

1. Safety	<ul style="list-style-type: none"> a) Shop safety regulations; precautions in the use of supply voltages and energized circuits; precautions in the use of chemicals; fire control; electrical shock; first aid procedures; artificial respiration; short-circuit and ground-fault hazards.
2. Tools	<ul style="list-style-type: none"> a) Care and responsibility in the proper use of measuring devices and hand and power tools.
3. Sources and characteristics of electricity; electrical units	<ul style="list-style-type: none"> a) The nature, practical units, and relationships of voltage, current, resistance, power, and energy; b) methods of producing voltage; c) static and dynamic electricity; d) use of SI (metric) prefixes and conversion units; e) electron flow.
4. Management studies	<ul style="list-style-type: none"> a) Applied English (reports, office practices, materials ordering, forms processing); customer and interpersonal relations; work schedules; unions; staff problems; ethical practices; licences; routines; preventive-maintenance schedules; inventory control; warehousing; estimating.
5. Conductors, semiconductors, and insulators	<ul style="list-style-type: none"> a) Elementary electrostatics; the Bohr model of atomic structure; classification and structure of common materials.
6. Electrical connections	<ul style="list-style-type: none"> a) Construction of electrical splices; hydro regulations; b) safe soldering techniques; solderless connectors; c) wire wrapping techniques; spot welding.
7. Simple, series, and parallel circuits	<ul style="list-style-type: none"> a) Construction of circuits from schematic diagrams; b) effects of series and parallel loads; controls; repairing circuit faults; c) word descriptions; characteristics of series and parallel circuits; circuit analysis including complex circuits.
8. Ohm's Law	<ul style="list-style-type: none"> a) Formula, and application of Ohm's Law governing current, voltage drop, and resistance in series circuits; b) parallel circuits; c) theory and application of Ohm's Law governing current, voltage drop, and resistance in series and parallel circuits.

9. Circuit resistance, resistors, and conductor sizes	<ul style="list-style-type: none">a) Factors affecting conductor resistance; wire gauge; electrical codes and tables;b) factors affecting conductor resistance; resistor types; ratings and colour codes.
10. Magnetism; electromagnetism	<ul style="list-style-type: none">a) Properties of magnets and magnetic fields; types of magnets; construction and applications of electromagnets;b) magnetic laws; hand rules;c) magnetic shielding; forces of current-carrying conductors;d) theories; magnetizing and demagnetizing.
11. Cells and storage devices	<ul style="list-style-type: none">a) Types of dry cells – ratings, storage batteries, and maintenance; hydrometer reading; series and parallel cell connections – advantages and disadvantages.
12. Circuit protection devices	<ul style="list-style-type: none">a) Overloads and short circuits; types of fuses and ratings; types of circuit breakers and ratings;b) ground-fault circuit interrupters.
13. Electrical energy and power	<ul style="list-style-type: none">a) Generation and distribution; calculation of energy bills; power loss; cost comparison with other forms of energy;b) generation and distribution; environmental considerations; nuclear power; methods of power measurement; calculation of energy bills; power loss;c) challenge of meeting future requirements; understanding policies and actions taken for energy conservation; basic and equivalent power formulas.
14. Electrical measuring instruments	<ul style="list-style-type: none">a) Circuit connections and precautions when using voltmeters, ammeters, ohmmeters of analog or digital type;b) multifunction meters.
15. Types of electric current	<ul style="list-style-type: none">a) Introduction to alternating and direct current; definition of frequency;b) introduction to alternating and direct current; simple graphic representation of both; definition of cycle; the frequency spectrum.
16. Canadian Electrical Code and Ontario Safety Code	<ul style="list-style-type: none">a) Methods of utilization; classification; use of tables.
17. Signal systems	<ul style="list-style-type: none">a) Control and alarm systems;b) low-voltage remote control domestic systems.

18. Non-metallic sheathed-cable installation	<ul style="list-style-type: none"> a) Method of installation; typical application to residential circuits; common trade materials and wiring devices; b) reference to the Ontario Safety Code.
19. Armoured-cable installation	<ul style="list-style-type: none"> a) Terminating armoured cable; typical application to residential and industrial circuits.
20. Rigid and EMT conduit installation	<ul style="list-style-type: none"> a) Types of sizes; thread cutting and bending; support and draw-in of conductors.
21. Electric heating and heat-loss calculations	<ul style="list-style-type: none"> a) Determination of circuit requirements; types of radiators and thermostats; radiant heating.
22. Types of conductors and appliance cords	<ul style="list-style-type: none"> a) Methods of terminating cords; grounded appliances; significance and identification of live, neutral, and grounding conductors.
23. Building test equipment	<ul style="list-style-type: none"> a) Continuity and short-circuit tester; bell test set.
24. Lighting equipment	<ul style="list-style-type: none"> a) Repairing table lamps; types of bulbs and fixtures; b) types and applications of bulbs and fixtures.
25. Electric heating application	<ul style="list-style-type: none"> a) Servicing heating-element appliances – cleaning, testing, and replacing thermostats and elements; b) installing specific outlets; wiring heavy appliances; types of heating elements – open, calrod.
26. Electric motors	<ul style="list-style-type: none"> a) Types; servicing motor-driven appliances; principle of motor action; brush gear assembly; commutator and lubrication of bearings; pulleys and belts; selecting and installing single phase motors.
27. Use of service and parts catalogues	<ul style="list-style-type: none"> a) Nameplate, serial number, and model; assembly drawings; using manual index; inventory systems and controls.
28. Customer reports, work orders, and billing procedures	<ul style="list-style-type: none"> a) Reporting service on work orders; preparing estimates of repair costs; b) method of registering customer complaints; warranty claims; billing procedures.
29. Service-entrance installation	<ul style="list-style-type: none"> a) Voltages available, and circuit protection for residential services; b) commercial services.
30. Motors, generators, and controllers	<ul style="list-style-type: none"> a) Principles of operation; overcurrent and overload protection; manual starting switches.

31. Transformers	<ul style="list-style-type: none"> a) Parts and identification; nameplate information; primary and secondary operation; isolation of live chassis circuits; b) impedance matching.
32. Signal sources	<ul style="list-style-type: none"> a) Microphones; phonograph cartridges; speakers; other transducers; b) magnetic tape heads; film soundtracks; television cameras.
33. Inductance	<ul style="list-style-type: none"> a) Inductance and Lenz's Law; inductance in series and parallel circuits; types of inductors; inductive reactance.
34. Capacitance	<ul style="list-style-type: none"> a) Factors affecting capacitance; capacitance in series and parallel circuits; RC time constant; types of capacitors; capacitive reactance.
35. Radio circuits	<ul style="list-style-type: none"> a) Principles of radio transmission; simple radio transmitters; amplitude modulation; frequency modulation; stages of modern superheterodyne receivers.
36. Printed circuits	<ul style="list-style-type: none"> a) Methods used; masking; etchants; types of PC boards; b) photographic process; etch resist lacquers.
37. Semiconductors	<ul style="list-style-type: none"> a) Silicon and germanium crystals; donor and acceptor materials; current flow through N and P type semiconductor materials; PN junction; transistor action; b) common emitter amplifier; c) transistor bias rules; current gain; types.
38. AC power supplies	<ul style="list-style-type: none"> a) Types of rectifier circuits; filters; need for regulation; Zener-diode voltage regulation; voltage doubling and multiplying circuits.
39. Basic amplifiers and interstage coupling circuits	<ul style="list-style-type: none"> a) Bias circuits; leads; impedance matching; volume and tone controls.
40. Silicon-controlled rectifier (SCR)	<ul style="list-style-type: none"> a) Colour organ circuits; motor controls; dimmer circuit.
41. Kirchhoff's voltage and current laws	<ul style="list-style-type: none"> a) Series voltage drops; parallel branch circuits; series-parallel circuit analysis; related problems.
42. Electronic test instruments	<ul style="list-style-type: none"> a) The functions and applications of oscilloscopes, audio generators, logic probes, RF generators, impedance bridges, solid state devices testers, Hi-z 30M, curve tracers, solid state power supplies.

43. Schematics and wiring diagrams	<ul style="list-style-type: none">a) Reading and interpreting simple electronic symbols and schematics, logic device schematics, graphs, charts, and data tables;b) reading and interpreting electrical symbols, schematics and appliance-wiring diagrams, logic device schematics, electronic schematics, graphs, charts, and tables of data.
44. Digital concepts	<ul style="list-style-type: none">a) The computer as a decision-making device; binary number system; AND, OR, and NOT functions using switches; logic symbols; simple gate circuits.
45. Electromechanical devices in appliances	<ul style="list-style-type: none">a) Solenoids – operation and trouble-shooting; transmissions – operation and trouble-shooting; clutches – types (single- and two-speed), operation, and trouble-shooting; pumps – types (single- and two-stage), operation, and trouble-shooting.
46. Perspectives on employment	<ul style="list-style-type: none">a) Nature of work; occupations and related jobs; wages and job requirements; obligations and rights of employer and employee; local firms and organizations;b) further training and education;c) apprenticeship;d) postsecondary education.
47. Temperature controls	<ul style="list-style-type: none">a) Use of bimetallic strips to control and protect appliances.
48. Fasteners	<ul style="list-style-type: none">a) Identification and application of various types of appliance fasteners.

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP.27*.

††Courses in this subject field may be adapted for the advanced level of difficulty from general level guidelines.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	††	TAM
	Automotive Mechanics*	Sr	Basic	General	††	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	††	TCW
	Construction Technology*	Sr	Basic	General	††	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	††	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	††	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
4. Food Services Grouping	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	††	TGP
	Photography	Sr	Basic	General	††	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Forestry	Int	Basic	General	Advanced	THF
	Forestry	Sr	Basic	General	Advanced	THF
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials Processes and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Multisubject Shop*	Int	Basic			TIM
	Exploratory Shop Round*		Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	†	TMT
	Sheet Metal Practice	Sr	Basic	General	†	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
	Nursing Assistant*	Sr		General	TPN
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1985

Applied Electricity (Grades 9-10)

Electrical Technology (Grades 11-12)

Electronics (Grades 9-12)

Electrical Appliance Repair (Grades 9-12)

Computer Technology (Grades 11-12)

Curriculum Guideline

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*4. Food Services
Grouping*

Module 1, 1986



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Appendix

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Introduction to the Food Services Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, *Part B*, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. *Part A* provides essential background for the planning of all courses in technological studies. The following three sections in *Part A* are especially important in this regard: “The Aims of Technological Studies”, “Program Requirements”, and “Course Planning at the Department Level” (including the evaluation of both student achievement and the program). The ten subject groupings of *Part B* are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in *Part B* is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 of the food services grouping. The grouping includes four subjects: baking; food preparation – commercial; food preparation – domestic; and restaurant services. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, the courses will be their initial introduction to the occupational areas within the food services grouping. For some, enrolment will be the first step towards an apprenticeship as a baker, cook, or meat cutter. For others, it will be an introduction to other occupations in commercial food services, such as waiter or waitress. For many, it will lead to postsecondary studies. While each of the four subjects outlined in this document deals with unique content, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses under any of these four subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic and general level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined

as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses in this module will be planned to achieve specific objectives, which should be based on the aims for courses at the basic and general levels. The nature of the core aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students’ knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the core aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled “Course Content for the Food Services Grouping”, at the end of this module, or from the course content listed at the end of any other module in *Part B*.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the food services grouping. The content units listed on the charts correspond to the numbered items listed in “Course Content for the Food Services Grouping”. The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 4.1.9 provides a summary of the core content for all courses in the food services grouping. This summary chart is intended to provide a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at either level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Food Services Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from floral design in the horticulture component may be incorporated into the restaurant services program if floral arrangements is selected as an appropriate topic.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in food services, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., baking, basic and general levels) or at different

grade levels (e.g., restaurant services, Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students acquire these skills, they are motivated to acquire related knowledge and develop desirable attitudes and understanding. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is preparing a particular food item or performing a particular restaurant service. Significant aspects of the completed product or service are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for

self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in food services courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's progress on such assignments is a valid technique for assessing progress in these areas.

One of the most efficient ways of evaluating students' achievement in a food services course is by observing their work each day. Students should be made aware that this form of assessment is being used, and there should be frequent discussions between the teacher and each student about the student's progress. Some of the factors that the teacher should watch for and evaluate are organizational skills, hygienic practices, skill mastery, safety precautions, efficiency, ability to clean up, co-operation, and leadership. Often a student knows how to perform a given task but has

difficulty in communicating this knowledge in writing. Asking the student to perform the task is often the best way to determine whether the student knows how. Evaluation should be as non-threatening as possible.

Additional comments about the evaluation of student achievement and some suggestions related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained through these experiences is particularly important to young people, who can expect to face a working life characterized by changing technology and the constant need to update their skill and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should also have opportunities to become aware of the various tasks that computer technology performs in the food services field. Visits to production and service operations and to training centres can show students how computer technology is used to access, record, and process information as well as to control some food production operations.

Baking

Intermediate Division

(Grades 9 and 10)

Courses in this subject are intended to introduce students to the trade of baker. Opportunities should be provided for students to experience a wide range of baking techniques and to develop skills such as mixing, blending, baking, and finishing a variety of baked goods in quantity.

The exploratory opportunities in this field can prepare students for entry into, and further training in, a variety of occupations ranging from the trades of junior baker and baker to related occupations in sales, marketing, and production of baked goods. They also lead to knowledge and skills for personal use in a subject medium that has a wide scope for creative endeavour.

Students who continue into Senior Division baking courses that are registered in the provincial Linkage program will have an opportunity to earn training credits that provide partial exemption from the in-school course

work required for apprenticeship in the baking trade. Information on this program is available from the directors of the regional offices of the Ministry of Education.

Courses in baking are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 4.1.1 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division baking courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, pastries, and quick breads.

Chart 4.1.1
Core Content for
Baking
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	a	ad
2. Safety	a	abc
3. Basic shop practices	ab	ab
5. Opportunities in the food services industry		b
6. Pastries	a	a
7. Yeast goods	a	b
8. Quick breads	a	a
9. Cakes	a	a
10. Cookies	a	a
11. Fillings	a	ab
12. Icing cakes	a	ab
53. Soft desserts		a
55. Dairy products		a

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFB1B for Grade 9 and TFB2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their abilities;
- develop co-operative attitudes towards their colleagues and supervisors;
- acquire elementary skills and knowledge of baking;
- properly use a variety of tools, utensils, and equipment commonly used in the food services industry;
- be introduced to the requirements outlined in relevant sections of the Public Health Act;
- learn and practise safe working habits and procedures in a baking shop;
- acquire knowledge of careers and further training opportunities in the baking industry and a perspective on the place of this industry within the wider food services field.

Suggestions for Teachers

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific materials, equipment, and environmental situations when the appropriate circumstances arise. General baking shop safety, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course.

At the basic level of difficulty, students should acquire a knowledge of the various types of flours and shortenings. This knowledge can be linked to the identification and correct use of utensils such as wooden spoons, spatulas, wire whips, flour sifters, and knives.

For courses at the basic level of difficulty, practice in simple recipe conversions and in the estimation of costs is useful reinforcement of the computational skills that students will require. Practical skills in the measurement of volume and mass (using specialized techniques for dry and wet measurement) and in the reading of temperature scales can be related to the students' science studies.

Grade 9 and 10 courses should be exploratory in nature, providing as wide a range of core learning experiences as possible within the course time allotted. Students taking these courses should also acquire some perspective on the place of the baking industry within the broad field of food services.

Catering contracts and show competitions, as well as special events such as Christmas and Easter, or major school functions such as banquets, can serve as themes to structure student learning activities in all courses. Themes based on ethnic specialties can also stimulate a high level of interest among students.

Opportunities to create baking displays should be provided periodically. It is important also to have displays that focus on career opportunities.

General Level

Course codes assigned to general level courses planned under this section will be TFB1G for Grade 9 and TFB2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their ability to acquire and demonstrate skills related to the baking industry;
- develop co-operative attitudes towards work with colleagues and supervisors;
- acquire fundamental skills and knowledge associated with baking;
- recognize and properly use a variety of equipment, utensils, and tools used in preparing food and baking;
- be introduced to appropriate sections of the Public Health Act outlining requirements related to commercial baking;
- learn and practise safe working habits;
- acquire knowledge of careers and further training opportunities in the baking industry and a perspective on the place of this area within the wider food services field.

Suggestions for Teachers

The theory related to bakery chemistry, ingredients, and fermentation should be treated in greater depth at higher difficulty and grade levels. The acquisition by students of this theoretical knowledge should be an objective of each course at the general level of difficulty. Students should acquire a knowledge of the various types of flours, shortenings, dairy products, sugar, salt, and leavening agents. The correct use of various tools and utensils commonly used in a commercial bakery should be stressed.

For courses at the general level of difficulty, practice in quantitative conversions of recipes and in methods of costing bakery products provides useful reinforcement of the computational skills that students will require.

The sale of baked goods provides good practical experience and helps students learn to complete projects in time to meet deadlines. Such activities also give students a sense of pride, by placing a monetary value on their work.

Suggestions outlined in the preceding section for the basic level may be adapted to courses planned for the general level. Content can be treated at greater depth in general level courses than in basic level courses. In a bi-level class, independent study of enrichment topics can be an effective technique for students who take the course at the general level.

The training profile for the trade of baker, available through the provincial Linkage program, provides specific performance objectives and criteria and is a useful resource for the baking teacher when planning these initial courses.

General safety in a commercial or institutional bakery should be discussed in greater depth at this level of difficulty.

Baking

Senior Division

(Grades 11 and 12)

Courses in baking are intended to introduce students to the trade of baker. Students should experience a wide range of baking techniques, should develop skills such as mixing, blending, baking, and finishing a variety of baked goods in quantity, and should acquire insights into employment and further training opportunities in the trade. These courses can prepare students for entry into, and further training in, a variety of occupations ranging from junior baker, baker, and pastry chef to related occupations in sales, marketing, and production of baked goods. Baking provides a wide scope for creative endeavour and personal use.

Students who take courses that are registered in the provincial Linkage program will have an opportunity to earn training credits that provide partial exemption from the in-school course work required for apprenticeship in the baking trade. Information on this program is

available from the directors of the regional offices of the Ministry of Education.

Courses in baking are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 4.1.2 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division baking courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, pastries, yeast goods, and quick breads.

Chart 4.1.2
Core Content for
Baking
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	d	bc
2. Safety	ac	a
3. Basic shop practices	ad	ade
4. Planning of work	b	ab
5. Opportunities in the food services industry	be	d
6. Pastries	b	c
7. Yeast goods	a	b
8. Quick breads		b
9. Cakes	b	c
10. Cookies	b	c
11. Fillings	b	c
12. Icing cakes	b	c
16. Egg cookery	a	a
26. Diet cookery		a
27. Basic nutrition	a	a
29. Storage and receiving		a

Content Units	Core Content for Courses	
	Basic	General
41. Freezing techniques		b
50. Food management		a
51. Canada's Food Guide	a	a
53. Soft desserts	a	
55. Dairy products	a	
56. Fruit preparation	a	b

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFB3B for Grade 11 and TFB4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their abilities;
- develop co-operative attitudes towards their colleagues and supervisors;
- acquire the rudiments of baking;
- recognize, select, and use appropriately the major equipment, utensils, and tools commonly used in a commercial bake shop;
- develop knowledge, understanding, and skill in meeting the requirements of the Public Health Act and other legislation related to personal cleanliness and sanitary conditions for equipment, supplies, and working areas;

- learn and practise safe working habits and procedures as they apply in a commercial bake shop;
- become involved in co-operative education placement in the bakery industry;
- qualify for apprenticeship credit through the Linkage program;
- acquire knowledge of careers and further training opportunities in the baking industry and a perspective on the place of this area within the wider food services field.

Suggestions for Teachers

Special safety rules related to specific equipment, materials, and environmental situations should be introduced by the teacher when the appropriate circumstances arise. General safety in a commercial or institutional bake shop, and the responsibility of every student in this regard, should be discussed early in the course and followed as normal practice.

Students who are beginning to specialize in baking can undertake projects that require planning, procuring special supplies, and

packaging the finished products. For this type of activity, it is necessary to ensure that blocks of two or more consecutive periods are provided in the timetable for each baking class so that food preparation, the actual baking, and clean-up can be accomplished in one working session.

Students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on some assigned tasks and to assume leadership roles in assisting their peers in other tasks.

The performance objectives outlined in the baker training profile for the apprenticeship program can also serve as curriculum content for Senior Division courses in baking. Students who take courses that are based on this section and are registered in the provincial Linkage program for baker may earn training credits that will excuse them from part or all of the basic in-school course for baker apprentices. It is possible to plan the series of courses in a secondary school baking program over three or four years (starting in Grade 9 or 10) so that students can satisfactorily achieve the terminal performance criteria for the complete basic course (normally covered by apprentices in fifteen weeks of full-time attendance at college). This basic course is the complete in-school requirement for junior baker (Branch I of the baker trade).

It should be noted that the terminal performance criteria for the baker training profile are at the basic level of difficulty. Students who may have taken their Intermediate Division course work at the basic level of difficulty, and who are working on Senior Division courses planned to cover the training profile content, can generally function in the Senior Division at this level of difficulty because

of the performance-based approach of the training profile. In rare cases, students will experience difficulty in understanding the theory components of the profile and will require extra assistance to permit them to enter an apprenticeship.

In Senior Division courses that use themes based on major units of the baking trade, it is also desirable to relate the course work to school events (e.g., Christmas cake sales to raise money for the students' council). Several themes may operate simultaneously in Senior Division courses. The use of parallel themes provides increased opportunities for students to attain course objectives related both to the core aims and to the training profile.

Students can also benefit from co-operative education and work experience at an early stage in their Senior Division courses. Such experiences can help students explore baking careers. Work experiences in Grade 12, or an extended co-operative education approach, can reinforce and further develop many course objectives, as well as increase students' chances for successful employment after graduation.

General Level

Course codes assigned to general level courses planned under this section will be TFB3G for Grade 11 and TFB4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their abilities;
- develop co-operative attitudes towards their colleagues and supervisors;
- understand and acquire the fundamental skills of baking;
- recognize, select, and use appropriately the major equipment, utensils, and tools commonly used in a commercial bake shop;
- develop knowledge and understanding of, and skill in complying with, requirements of

- appropriate sections of the Public Health Act and other legislation related to personal cleanliness and sanitary conditions for equipment, supplies, and working areas;
- learn and practise safe working habits and procedures appropriate to a commercial bake shop;
- become involved in co-operative education placement in the bakery industry;
- qualify for apprenticeship credit through the Linkage program;
- acquire knowledge of careers and further training opportunities in the baking industry and a perspective on the place of this industry within the wider food services field.

Suggestions for Teachers

In baking courses at the general level of difficulty, learning associated with safety in the bake shop should lead students to develop a positive attitude towards safety in activities in and out of school. The safety awareness that students acquire should lead them to recognize hazardous situations and to be alert to procedures that are safe and effective.

The sale of baked goods provides excellent practical experience in meeting deadlines, producing quality products, and dealing with the public. Students who are specializing in baking can undertake the planning, purchasing, and costing of baked goods for special events in the school or community.

It is essential, in the Senior Division food services programs, that blocks of approximately 1 1/2 to 2 hours be provided in the timetable to allow each class to be involved in the preparation, baking, finishing, and clean-up associated with baking production.

Suggestions outlined in the preceding section for the basic level may be adapted to courses planned for the general level. In particular, the comments related to the Linkage program for baking apply as well to general level courses.

Work experience can benefit students at any stage of their Senior Division course work. Early experiences can help students explore careers in the subject field, whereas later experiences can reinforce and further develop the course objectives. Co-operative work experience, extended work experience, and part-time work in the baking industry can all improve student chances for employment and career success after graduation.

Food Preparation – Commercial

Intermediate Division (Grades 9 and 10)

Courses in commercial food preparation are intended to provide students with practical experiences in the quantity preparation, seasoning, and cooking of soups, meats, fish, poultry, vegetables, salads, and desserts. Students should also be introduced to the many occupational opportunities associated with this subject area and should develop some perspective on the broad food services field.

Towards the end of the Intermediate Division, themes of these courses can focus on the trades of cook (or assistant cook) and retail meat cutter. Commercial food service activities such as catering, food processing, and storage may also be used as themes. Where the theme of a course based on this subject relates to the trade of cook or retail meat cutter, the course may be registered in the provincial Linkage program for the particular trade. Students who continue into apprenticeship or further training in these areas can then receive training credit for their in-school course work. Information on the Linkage program is available from the directors of the regional offices of the Ministry of Education.

Courses in commercial food preparation are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 4.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, basic sauces, soup cookery, vegetable cookery, and meat cookery.

Chart 4.1.3
Core Content for
Food Preparation –
Commercial
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	a	ad
2. Safety	a	abc
3. Basic shop practices	ab	ab
5. Opportunities in the food services industry		b
13. Basic stock	a	ab
14. Basic sauces	a	ab
15. Soup cookery	a	abc
16. Egg cookery	a	ab
17. Fish	ae	ace
18. Potato cookery	c	bc
19. Vegetable cookery	d	bd
20. Meat cookery	be	abe
21. Farinaceous dishes	b	bc

Content Units	Core Content for Courses	
	Basic	General
22. Steam table	a	a
32. Salad preparation	a	a
33. Grilling procedures	ab	abc
34. Deep-fat procedures	b	a
36. Breakfast cookery		a
51. Canada's Food Guide	a	a
52. Dishwashing procedures	a	a
55. Dairy products		a
59. Garnish		a
60. Poultry cookery	a	ab

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFC1B for Grade 9 and TFC2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their ability to acquire and demonstrate skill and knowledge in food preparation;
- develop co-operative attitudes towards their colleagues and supervisors;
- acquire fundamental knowledge and skill in

- preparing and cooking food in quantity;
- recognize and use properly a variety of equipment, utensils, and tools used in preparing food;
- be introduced to the requirements of appropriate sections of the Public Health Act;
- discover careers and further training opportunities in the food industry.

Suggestions for Teachers

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific equipment, materials, and environmental situations when the appropriate circumstances arise. General safety in a commercial or institutional kitchen, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course.

Courses offered at the basic level of difficulty can focus initially on the skills related to the use of tools and equipment for cutting and

preparing vegetables, meats, and fish. Opportunities for students to practise basic cooking methods such as sautéing, roasting, and boiling should also be a part of these courses. The development of efficient, safe, and sanitary work habits must be stressed in all activities.

Practice in numerical recipe conversions and estimation of costs is useful reinforcement of the computational skills that students will require. Practical skills in the measurement

of volume and mass (using specialized techniques for dry and wet measurement) and in the reading of temperature scales can be related to the students' science studies.

Special events such as Christmas or Easter, or major school functions such as banquets or other catered events, can serve as themes to structure student learning activities. Themes based on ethnic specialties also appeal to students.

Grade 9 courses should be exploratory in nature, providing an overview of the food services industry and relating to this overview as wide a range of core learning experiences from this section as is possible in the course time allotted.

Grade 10 courses may begin to develop major themes that can become specialties in Senior Division courses. Quantity-cooking activities may develop around one or more of the following themes: the trade of assistant cook or retail meat cutter, catering projects, institutional cooking, and diet cooking. The training profile for the trade of cook, available through the provincial Linkage program, provides clear objectives for the skills required and can be a useful resource for teachers when planning these courses. In Grade 10 courses, students should have opportunities to practise all of the basic cooking procedures and to learn to follow recipes. The units of core content can be taught at a greater depth than in

Grade 9, and topics from units 6, 17, 21, 27, 31, 32, 33, 34, 36, 38, and 55 in the list of course content starting on page 36 can be selected as appropriate to the course and theme. The knowledge, skills, and work habits acquired in these courses should form a base from which students can advance to further training in this career area.

Institutional and diet cooking, mentioned above as possible quantity-cooking themes, could also include units 26 and 27 from the course content at the end of the food services grouping. Practical projects should include the preparation of meals to be served to special groups such as the elderly, children in day-care centres, or convalescents. To compensate for the possible flavour and content limitations of food prepared under this theme, the stress should be placed on the aesthetic presentation of the prepared food.

Where suitable facilities are available and occupational opportunities exist, a theme of food processing and storage or retail meat cutting may be offered in courses based on this subject. For a theme of retail meat cutting, the course content from units 39, 40, and 41 may be included in the Grade 10 and Senior Division courses based on this subject. The training profile for retail meat cutter, available through the provincial Linkage program, provides a useful resource for identifying the learning objectives related to this trade.

General Level

Course codes assigned to general level courses planned under this section will be TFC1G for Grade 9 and TFC2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride and confidence in their ability to prepare food;
- develop co-operative attitudes towards their colleagues and supervisors;
- acquire basic skills in preparing and cooking foods in quantity using commercial procedures;
- recognize and properly use a variety of tools and equipment in the preparation and cooking of food;
- be introduced to the requirements of appropriate sections in the Public Health Act;
- learn and practise safe working habits;
- become familiar with the careers in the food industry.

Suggestions for Teachers

The development of safe work habits and a general awareness of safety in a commercial or institutional kitchen are generic learning outcomes of the course that can be related to many other student activities. Ideally, students in the course should acquire positive attitudes towards safety that can serve them in their everyday living as well as on the job.

Suggestions outlined in the preceding section for the basic level may be adapted to courses planned for the general level. The comments relative to themes for quantity cooking, retail meat cutting, institutional and diet cooking, food processing and storage, and Linkage programs for chef and retail meat cutter apply as well to general level courses.

In contrast to basic level courses, courses planned for the general level should not only include the additional core content outlined on chart 4.1.3 but also encourage students to gain insights about the broader principles that are common to procedures involving particular types of equipment and food materials.

Students taking courses based on this section should be informed of the apprenticeship requirements for chef, of the procedure for securing an apprenticeship, of local occupational opportunities, and of postsecondary programs that offer continuing study in the field.

Food Preparation – Commercial Senior Division (Grades 11 and 12)

Courses in the Senior Division in commercial food preparation are intended to provide students with practical experiences in the quantity preparation, seasoning, and cooking of soups, meats, fish, poultry, vegetables, salads, and desserts. Students should also be introduced to the many occupational opportunities associated with this subject area and should develop some perspective on the broad food services field.

Where the theme of a course based on this section relates to the trade of cook or retail meat cutter, the course may be registered in the provincial Linkage program for the particular trade. Students can then continue into apprenticeship or further training in these areas. Information on this program is available from the directors of the regional offices of the Ministry of Education.

Courses in commercial food preparation are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 4.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, basic sauces, soup cookery, fish, vegetable cookery, and meat cookery.

Chart 4.1.4
Core Content for
Food Preparation –
Commercial
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	d	bc
2. Safety	ac	a
3. Basic shop practices	ad	ade
4. Planning of work	b	abc
5. Opportunities in the food services industry	be	d
6. Pastries	a	a
13. Basic stock	b	ab
14. Basic sauces	c	d
15. Soup cookery	bc	bcd
16. Egg cookery	b	c
17. Fish	c	bd
18. Potato cookery	b	ad
19. Vegetable cookery	c	ac
20. Meat cookery	ag	gh
21. Farinaceous dishes	bc	ad

Content Units	Core Content for Courses	
	Basic	General
23. Banquet preparation		a
24. Buffet preparation	b	bc
25. International dishes		a
27. Basic nutrition	a	a
29. Storage and receiving		a
32. Salad preparation	b	b
33. Grilling procedures	c	
34. Deep-fat procedures	c	c
36. Breakfast cookery	a	ab
38. Microwave cookery		a
40. Storage of goods and meat		a
41. Freezing techniques		a
50. Food management		a
55. Dairy products	a	
56. Fruit preparation	a	b
59. Garnish	a	
60. Poultry cookery	b	

See “Course Content for the Food Services Grouping”, beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFC3B for Grade 11 and TFC4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop confidence in their skills and ability, and pride in their work;
- acquire basic skills in preparing and cooking foods in quantity using commercial procedures;
- acquire skills in selecting, from among the equipment, utensils, and tools available in a commercial kitchen, the implements appropriate to particular food preparation tasks;
- acquire knowledge and understanding about the Public Health Act;
- develop and demonstrate safe personal work habits;
- learn about career opportunities and training in the food industry;
- become involved in co-operative education placement in the food service industry;
- qualify for credit towards an apprenticeship through the Linkage program.

Suggestions for Teachers

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific equipment, materials, and environmental situations when the appropriate circumstances arise. General safety in a commercial or institutional kitchen, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course.

Courses offered at the basic level of difficulty can focus initially on improving skills related to the use of tools and equipment for cutting and preparing vegetables, meats, and fish. Opportunities for students to practise basic cooking methods such as sautéing, roasting, and boiling should be an ongoing part of these courses. The development of efficient and sanitary work habits must be stressed in all activities.

Practice in numerical recipe conversions and estimation of costs is useful reinforcement of the computational skills that students will require. Practical skills in the measurement of temperature and the reading of thermometer scales can be related to the students' science studies. Techniques for measuring volume and mass (using specialized methods for dry and wet materials) may be included in such studies as well.

Special events such as Christmas or Easter, or major school functions such as banquets or other catered events, can serve as themes to structure student learning activities. Themes based on ethnic specialties also appeal to students.

The performance objectives outlined in the cook training profile for the apprenticeship program can also serve as curriculum content for Senior Division courses in commercial food preparation. Students who take courses based on this section that are registered in the provincial Linkage program for cook may earn training credits that will excuse them from part or all of the basic in-school course for cook apprentices. It is possible to plan the series of courses in a secondary school program in commercial food preparation over three or four years (starting in Grade 9 or 10)

so that students can satisfactorily achieve the terminal performance criteria for the complete basic course (normally covered by apprentices in fifteen weeks of full-time attendance at college). This basic course is the complete in-school requirement for assistant cook (Branch I of the cook trade).

The general objectives outlined in the training profile for retail meat cutter, available through the Linkage program, are authorized as curriculum content in Senior Division courses in commercial food preparation. Much of the in-school work from the training profile will be of a theoretical nature. However, these courses are ideally suited to co-operative education. The high volume of material normally processed in a commercial establishment during the on-the-job component provides students with an opportunity for practising trade skills.

It should be noted that the terminal performance criteria for the cook training profile are at the basic level of difficulty. Students who may have taken their Intermediate Division course work at the basic level of difficulty, and who are working on Senior Division courses planned to cover the training profile content, can normally achieve the requirements of the Linkage program under the performance-based approach of the training profile. Where this is not possible, more limited themes – focusing, for example, on short-order items or salads – may be developed.

In Senior Division courses that use themes based on major units of the cook or retail meat cutter trade, it is also desirable to relate the course work to school events. These can provide increased opportunities for attaining course objectives related both to the subject aims and to the training profile.

Students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students.

Work experience can benefit students at any stage of their Senior Division course work.

Early experiences can help students explore careers in the subject field, whereas later experiences can reinforce and further develop all of the course objectives. Co-operative

work experience, extended work experience, and part-time work in the food preparation field can all improve student chances for employment and career success after graduation.

General Level

Course codes assigned to general level courses planned under this section will be TFC3G for Grade 11 and TFC4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in their skills and ability, and confidence about applying their skills in various work situations;
- develop skills in the preparation and cooking of foods using commercial procedures;
- develop skill and knowledge in selecting, from among the equipment, utensils, and tools available in a commercial kitchen, the implements appropriate for particular food preparation tasks;
- acquire knowledge and understanding of appropriate sections of the Public Health Act;

- develop and demonstrate safe personal work habits and a positive attitude towards maintaining safety in the workplace;
- relate knowledge of mathematics and science to applications in food preparation;
- become involved in co-operative education placement or work experience in the food service industry;
- acquire an overview of the occupational opportunities available in the food preparation industry and an understanding of educational and training requirements for these occupations.

Suggestions for Teachers

The development of safe work habits and the ability to recognize hazards to safe working conditions, indicated in the content of unit 2, can be related to a variety of other student activities. Students should develop positive attitudes towards safety that can be reflected in all their day-to-day activities in and out of school.

Suggestions outlined in the preceding section for basic level courses may be adapted to courses planned for the general level. The comments relative to themes for special events and the Linkage programs for cook and retail meat cutter apply as well to general level courses.

Courses at the general level should lead students to recognize the broader principles inherent in the various procedures they apply in food preparation. In some cases such principles may include science concepts they will

have acquired. In other cases the principles may provide a basis for innovative preparations with different food materials. In all cases students should strive not only to prepare foods to perfection but also to present them aesthetically.

In addition to exploring career opportunities in the food preparation field through co-operative work experience, extended work experience, and/or part-time work, students taking their courses at the general level should be made aware of the various postsecondary programs offered by colleges of applied arts and technology to further prepare students for occupations in the food services and hospitality industries.

Food Preparation – Domestic Intermediate Division (Grades 9 and 10)

Courses in domestic food preparation are intended to provide students with the knowledge and skills necessary to prepare, cook, and serve meals that are nutritionally adequate and aesthetically appealing. In addition, graduates should be able to implement effective food management practices in planning a household food budget and purchasing and storing foods.

Courses in this subject are aimed at developing the knowledge and skills necessary for producing good, economical family nutrition using the home kitchen. This learning is intended to support occupational roles associated with home and family-care work rather than work in commercial kitchens.

Courses in domestic food preparation are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 4.1.5 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject

may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, soup cookery, sandwich making, and soft desserts.

There is considerable overlap in content between commercial and domestic food preparation. The type of food preparation facilities available in a school is an important consideration in the choice of subject. In school programs where courses are offered in both subjects, the choice of courses within each division should be structured to avoid significant overlap. In this connection, teachers planning courses in domestic food preparation should be guided by the comments under "Program and Course Planning" in the introductory section of this module.

Chart 4.1.5
Core Content for
Food Preparation –
Domestic
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	a	ac
2. Safety	a	ab
3. Basic shop practices	ab	abf
4. Planning of work		a
9. Cakes		a
10. Cookies	a	a
11. Fillings	a	a
12. Icing cakes		a
15. Soup cookery	a	a
16. Egg cookery	a	a
17. Fish	a	a
18. Potato cookery	b	b

Content Units	Core Content for Courses	
	Basic	General
19. Vegetable cookery	d	bd
20. Meat cookery	b	ae
28. Grocery selection	a	a
30. Meal planning		c
31. Sandwich making	a	a
36. Breakfast cookery		a
42. Table set-up	a	a
51. Canada's Food Guide	a	a
52. Dishwashing procedures	b	ab
53. Soft desserts		a
54. Non-alcoholic beverages		a
55. Dairy products		a
59. Garnish		a
60. Poultry cookery		a

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFD1B for Grade 9 and TFD2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop confidence in their abilities to acquire skills and knowledge in food preparation and to work co-operatively with others;
- learn how to prepare and serve, within a given budget, foods that are appetizing and nourishing;

- prepare, serve, and store foods so as to maintain their nutritional and sanitary quality;
- acquire basic knowledge in food purchasing and storage;
- acquire knowledge of healthful eating habits and food management;
- acquire knowledge of safe working habits.

Suggestions for Teachers

Courses at the basic level of difficulty will familiarize students with the basic skills and knowledge they require for planning and preparing a healthy diet. It is important that students understand the necessity for good nutrition and the advantages of good food management. Learning activities in these areas

should be realistic relative to students' needs. Boys should be encouraged to take these courses.

The use of themes can serve as a structure for student learning activities in all courses. Themes can relate to holiday periods such as

Christmas or Easter, or they can relate to special occasions such as birthday parties, anniversaries, or showers. Themes based on ethnic specialties can also stimulate a high level of interest among students. Parallel themes can focus on the particular nutritional needs of a family member such as a baby, an adult doing full-time work involving heavy labour, or an elderly grandparent.

Courses that stress the nutrition aspect of food preparation should include additional topics from units 30, 48, 49, and 51, listed in the course content at the end of this module.

As well as menu and meal preparation, the packing of nutritious school or work lunches and the planning of picnics are practical activities that may be included in the course.

Courses that stress the food management aspect of food preparation should include additional topics from units 29, 30, 40, and 50. In general, courses with special emphases can begin in Grade 10. Grade 9 courses should be exploratory in nature, providing an overview of the subject field and including as wide a

range of core learning experiences as possible in the available time.

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific equipment, materials, and environmental situations when the appropriate circumstances arise. General safety in the kitchen, and the responsibility of every student in this regard, should be discussed at the beginning of the course and stressed as a part of all student activities.

For courses at the basic level of difficulty, practice in numerical recipe conversions and in estimation of costs is useful reinforcement of the computational skills that students will require.

Practical skills in the measurement of volume and mass (using specialized techniques for dry and wet measurement) and in the reading of temperature scales can be related to students' science studies.

General Level

Course codes assigned to general level courses planned under this section will be TFD1G for Grade 9 and TFD2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the skill and knowledge required to prepare and serve appetizing foods that are nutritious and within a planned budget;
- gain experience in purchasing and storing food (without reducing nutrition or flavour) based on facilities in a regular domicile;

- acquire knowledge of healthful eating habits and regular food management;
- learn safe working habits and practise them;
- acquire basic menu-planning techniques;
- become aware of opportunities for employment and further training in food preparation.

Suggestions for Teachers

Courses at the general level for Grades 9 and 10 should provide students with the basic skill and knowledge they require to plan and prepare nutritious and attractive meals for members of a family. Students should be able to develop itemized lists of food purchases necessary for achieving these objectives within a given budget.

Meal planning and menu preparation for a given family can be a significant theme in these courses. The structure of the family can be changed by the addition of a baby or elderly grandparent. Special nutritional needs of the new family member may then be accommodated in the meal planning.

Most of the suggestions outlined for basic level courses in the preceding section may be adapted to courses planned for the general level. The core learning for general level courses includes core content such as breakfast cookery, poultry, dairy products, soft desserts, and cakes in addition to the core content for basic level courses. The addition of these topics both increases the scope for meal planning and provides experience with new preparation methods.

Students should have the chance to explore some of the occupational options in the food preparation field. Where time permits and

opportunities are available, such exploration can be supported through visits from food services professionals, field trips, arranged work experiences, co-operative work experience, and/or part-time work. Students taking their courses at the general level should also be made aware of the various postsecondary programs offered at colleges of applied arts and technology. These programs can further prepare interested students for a variety of occupations in the food services and hospitality industries.

Food Preparation – Domestic Senior Division (Grades 11 and 12)

Courses in domestic food preparation in the Senior Division are intended to further develop the knowledge and skills students need to properly plan, prepare, and serve appetizing meals that are nutritionally adequate and aesthetically appealing. Graduates of these courses should be able to plan menus that serve the particular needs of individuals and/or special events within predetermined budgets. The purchasing and storing of foods (vital components of good food management) are also parts of the program.

Students who complete courses in this subject should acquire the knowledge and skills they need to produce appetizing and economical family nutrition using the home kitchen. Such knowledge and skills are intended to support personal and/or occupational roles associated with home and family-care work and entrepreneurial initiatives such as catering based on home kitchens. Courses that are intended to prepare students for work in commercial kitchens should be based on commercial food preparation.

Courses in domestic food preparation are authorized for Grades 11 and 12 at basic and

general levels of difficulty. Chart 4.1.6 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, basic shop practices, soup cookery, salad preparation, sandwich making, and soft desserts.

The comments at the beginning of the preceding section for the Intermediate Division, about the need for schools to structure course choices when courses in both domestic and commercial food preparation are available, apply as well to the Senior Division.

Chart 4.1.6
Core Content for
Food Preparation –
Domestic
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	c	e
2. Safety	ab	a
3. Basic shop practices	ab	abf
4. Planning of work		ac
6. Pastries	a	a
7. Yeast goods	a	a
8. Quick breads	a	a
9. Cakes	a	
11. Fillings		b

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
12. Icing cakes	a	
13. Basic stock		a
14. Basic sauces	a	a
15. Soup cookery	b	b
16. Egg cookery	b	bc
17. Fish	d	de
18. Potato cookery		a
19. Vegetable cookery	c	ac
20. Meat cookery	ae	g
21. Farinaceous dishes	b	bc
26. Diet cookery		a
27. Basic nutrition	a	a
28. Grocery selection		b
29. Storage and receiving		a
30. Meal planning	b	a
32. Salad preparation	a	a
36. Breakfast cookery	a	c
42. Table set-up	a	b
48. Preparation of portable foods	b	ab
49. Entertainment		a
52. Dishwashing procedures	a	
53. Soft desserts	a	
54. Non-alcoholic beverages	a	
55. Dairy products	a	
56. Fruit preparation	a	b
59. Garnish	a	
60. Poultry cookery	a	b

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFD3B for Grade 11 and TFD4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop confidence in their skills and abilities in food preparation, and pride in their work;
- acquire the fundamental skills and knowledge required to prepare and serve appetizing and nutritious foods;
- develop skills in planning menus that focus on various types of family groups, budgets, diets, and customs;
- prepare, serve, and store foods so as to maintain nutritional and sanitary quality;
- adapt food-purchasing and storage techniques for a family budget and available storage space;
- learn and practise safe working habits and procedures;
- acquire knowledge of career and training opportunities in the domestic food preparation area.

Suggestions for Teachers

Courses at the basic level of difficulty will familiarize students with the basic skills and knowledge necessary to provide a healthy diet. It is important that students understand the necessity for good nutrition and the advantages of good food management. Learning activities in domestic food preparation should be planned to reflect modest food budgets; limitations in the present and potential incomes of many of the students must be taken into consideration. Boys should be encouraged to take these courses.

The use of themes can serve as a structure for student learning activities in all courses. Such themes can relate to holiday periods such as Christmas or Easter, or they can relate to special occasions such as birthday parties, anniversaries, or showers. Themes based on ethnic specialties also stimulate a high level of interest among students. Parallel themes can focus on the particular nutritional needs of a family member such as a baby, an adult doing full-time work involving heavy labour, or an elderly grandparent.

Courses that stress the nutrition aspect of food preparation should include additional topics from units 30, 48, 49, and 51 in the course content for this subject grouping. As well as menu and meal preparation, the packing of nutritious school or work lunches and the

planning of picnics are practical activities to include in the course. Courses that stress the food management aspect of food preparation should include additional topics from units 29, 30, 40, and 50.

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific kitchen equipment, materials, and environmental situations when the appropriate circumstances arise. General safety in the kitchen, and the responsibility of every student in this regard, should be discussed at the beginning of the course and stressed throughout the course.

Whenever possible, students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students. Work experience can be of benefit to students at any stage of their Senior Division course work, once they have learned to work independently. Experience in domestic food preparation can be arranged in group homes or in other situations in which family-care workers are employed.

General Level

Course codes assigned to general level courses planned under this section will be TFD3G for Grade 11 and TFD4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to plan and perform tasks efficiently, using a logical series of operations;
- develop skills in preparing and serving foods in a home environment;
- develop skills in preparing a series of meal menus that focus on proper nutrition, pre-determined budget, diet, customs, quality, and aesthetic appearance;
- develop safe work habits and practices;
- acquire knowledge about food purchasing and storage techniques;
- develop general knowledge about career and training opportunities in the domestic food area.

Suggestions for Teachers

The topics listed in the core content for Intermediate Division courses may be treated at greater depth in the Senior Division. These topics and the additional core content topics listed for Senior Division may be augmented by any of the topics listed in the course content units at the end of this subject grouping or at the end of any other related subject grouping.

In Senior Division courses whose themes focus on either nutrition or food management, it is desirable to use, in addition, parallel themes related to school events. This combination of themes can provide increased opportunities for attaining course objectives.

Senior Division courses based on this section can be planned to supplement a course based on the home nursing, child care, and health care services section in the personal services subject grouping. Common themes such as child care and nursery service or homemaking

and family care can be supported most effectively through a joint approach by courses in the two subjects.

Suggestions and comments indicated in the preceding section for basic level courses can be adapted to courses planned for the general level of difficulty. The core learning for general level courses includes core content related to work planning, diet cookery, grocery selection, and storage and receiving in addition to the core content specified for basic level courses. Programs for the general level should deal with course content in greater theoretical depth than basic level programs. This requirement should be met, in particular, in studies such as basic nutrition and diet cookery, where the related science can be explored in parallel with the practical activities.

Restaurant Services

Intermediate Division

(Grades 9 and 10)

Courses in restaurant services are intended to provide students with practical experience in fast-food preparation and food service. The two possible specialties, short-order cooking and waiter/waitress training, may be given equal or unequal emphasis in any one course. The courses should provide students with some perspective on the broad field of food services and the occupational opportunities available within it.

Courses in restaurant services are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 4.1.7 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division restaurant services

courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, sandwich making, salad preparation, grilling procedures, and fountain service.

Where school programs offer courses in both restaurant services and food preparation (either commercial or domestic), the choice of courses within each division should be structured to avoid significant overlap. In this connection, teachers planning courses in restaurant services should be guided by the comments under "Program and Course Planning" in the introductory section of this module.

Chart 4.1.7
Core Content for
Restaurant Services
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	a	ad
2. Safety	a	abc
3. Basic shop practices	a	a
4. Planning of work	b	ab
5. Opportunities in the food services industry		b
16. Egg cookery	a	ab
17. Fish	a	a
20. Meat cookery	a	a
22. Steam table	a	a
31. Sandwich making	a	a
32. Salad preparation	a	a
33. Grilling procedures	ab	abc
34. Deep-fat procedures	b	a
35. Fountain service	a	ab
36. Breakfast cookery		a
37. Order taking and serving	a	ab
42. Table set-up	a	a

Content Units	Core Content for Courses	
	Basic	General
47. After-service duties	a	a
52. Dishwashing procedures	a	a
54. Non-alcoholic beverages		a
55. Dairy products		a
59. Garnish		a

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFR1B for Grade 9 and TFR2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop confidence in their ability to acquire skills and apply them to work situations in a courteous and businesslike manner;
- acquire basic knowledge and skill in fast-food preparation and service;
- properly use a variety of tools and equipment commonly used in the food services industry;
- learn and practise safe working habits and procedures related to food service operations;
- be introduced to the requirements of relevant sections of the Public Health Act;
- acquire knowledge of careers and further training opportunities in the restaurant services industry and a perspective on the place of this industry within the food services field.

Suggestions for Teachers

In dealing with the content of unit 2, teachers should introduce special safety rules related to specific equipment, materials, and environmental situations when the appropriate circumstances arise. General safety in the kitchen and dining area, and the responsibility of every student in this regard, should be discussed at the beginning of the course and stressed throughout the course.

Courses at the basic level of difficulty will familiarize students with the necessary safety rules and sanitation requirements of commercial kitchens and dining areas. Such activities as bussing dishes, operating dishwashers, and identifying and using the basic tools and

utensils associated with restaurant services will provide students with initial work-related practical skills. The skills necessary for success in a work situation should be identified as the course proceeds and reinforced until students can exercise them confidently and independently.

Whenever possible, students should be given the opportunity to cook for and serve peers, teachers, and visitors to the school. As part of their practical learning, this experience can give students practice in taking orders, preparing food, and serving. It also reinforces their awareness of the need for speed and accuracy

in meeting the needs of others. This type of activity can provide students with a sense of pride, by placing a monetary value on their work.

Grade 9 courses should be exploratory in nature, providing an overview of the food services field and relating this overview to the

wide range of core learning objectives identified in this section. Major themes related to short-order cooking or waiter/waitress duties can be developed in Grade 10 and in Senior Division courses.

General Level

Course codes assigned to general level courses planned under this section will be TFR1G for Grade 9 and TFR2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop pride in their ability to work cooperatively with others in delivering a food service;
- acquire fundamental skills and knowledge related to fast-food preparation and service;
- learn and practise safe working habits and procedures in a food service establishment;
- develop an understanding of the requirements of relevant sections of the Public

Health Act and other legislation related to personal cleanliness and sanitary conditions in the delivery of restaurant services;

- work on their own and with others in a courteous and businesslike manner;
- acquire knowledge of careers and further training opportunities in the restaurant services industry and a perspective on the place of this industry within the food services field.

Suggestions for Teachers

The use of themes can serve as an effective structure for the learning activities in all courses. These themes can relate to catered events at the school or to special holidays such as Christmas or Easter. Themes related to a particular emphasis in the course work (e.g., short-order cooking or the duties of a waiter/waitress) can be treated simultaneously with special-event themes.

Courses that stress a short-order cooking theme should include a study of selected topics from units 16, 33, 34, 35, and 36, which are listed in the course content for this subject grouping at the end of this module. Students should also be given a variety of practical experiences ranging from working at a refreshment counter to cooking meals. Portioning and arranging food attractively on a plate should be a part of this theme. Emphasis on efficient, safe work habits and cleanliness should be ongoing. Students must be kept aware of the importance of good sanitation and cleanliness.

Courses that focus on the theme of the duties of a waiter/waitress should include topics selected from units 43, 44, 45, and 46. Personal grooming should receive particular emphasis in this theme. Writing and numerical skills should be reinforced when waiter/waitress duties call for them.

Suggestions outlined for basic level courses in the preceding section may be adapted to courses planned for the general level. The core learning for general level courses includes content related to the planning of work, opportunities in the food services industry, and the preparation of various fast foods, in addition to the core content for basic level courses. Students in general level courses should gain insights into the overall processes involved in restaurant services, from attracting customers through preparing appetizing foods to pleasing the customer with efficient and considerate service.

Restaurant Services

Senior Division

(Grades 11 and 12)

Senior Division courses in restaurant services should provide students with practical experience in fast-food preparation and waiter/waitress duties in the serving of food. In any one course, the two specialties, short-order cooking and waiter/waitress training, may be given equal or unequal emphasis. The sequence of courses in the restaurant services program should provide students with the skills and knowledge necessary to enter employment or further training in either occupational role. The courses should also provide students with insights into various aspects of the food services field and the wide range of careers and further training available within it.

Courses in restaurant services are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 4.1.8 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division restaurant services courses

may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sanitation, hygiene, trade regulations, sandwich making, salad preparation, grilling procedures, breakfast cookery, and fountain service.

The comments in the introductory section of "Restaurant Services, Intermediate Division", about the need for structuring courses in food services to avoid significant overlap in content, apply as well to the Senior Division. Courses in food services programs may be structured into school-related packages that allow students to choose from a variety of occupational emphases. Additional information on such packages can be found in *Ontario Schools, Intermediate and Senior Divisions* (OSIS).

Chart 4.1.8
Core Content for
Restaurant Services
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Sanitation and trade regulations	d	bc
2. Safety	ac	a
3. Basic shop practices	af	af
4. Planning of work	b	ab
5. Opportunities in the food services industry	be	d
14. Basic sauces	a	a
15. Soup cookery	d	d
16. Egg cookery	b	c
17. Fish	c	ce
18. Potato cookery	c	c
19. Vegetable cookery	d	d
20. Meat cookery	fh	edh
23. Banquet preparation		d
24. Buffet preparation		d
27. Basic nutrition		a

Content Units	Core Content for Courses	
	Basic	General
29. Storage and receiving		a
31. Sandwich making		c
32. Salad preparation	b	b
33. Grilling procedures	c	
34. Deep-fat procedures	c	cd
35. Fountain service	b	c
36. Breakfast cookery	a	ab
37. Order taking and serving	b	c
38. Microwave cookery		a
42. Table set-up		b
43. Customer contacts		a
44. Types of service		a
45. Menu knowledge		a
46. Preparation of work stations	a	
47. After-service duties		b
50. Food management		a
51. Canada's Food Guide	a	a
52. Dishwashing procedures	a	
54. Non-alcoholic beverages	a	
55. Dairy products	a	
56. Fruit preparation		a
59. Garnish	a	

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TFR3B for Grade 11 and TFR4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- work responsibly on their own;
- gain confidence in working with others in a courteous and businesslike manner;
- further develop skills and techniques required to prepare and serve foods in a restaurant;
- learn and practise safe working habits and procedures as would be required in a food service establishment;

- develop competence in the communication skills required to understand and record requests, ideas, and information;
- develop knowledge and understanding of, and skill in complying with, the requirements of appropriate sections of the Public Health Act and other legislation as it applies to personal hygiene and sanitation of equipment, supplies, and work areas;
- participate in work experience and co-operative education programs related to the restaurant services industry;
- acquire knowledge of careers and further training opportunities in the restaurant services industry.

Suggestions for Teachers

Courses that stress a short-order cooking theme should include a study of selected topics from units 16, 33, 34, 35, and 36, listed in the course content for this subject grouping at the end of this module. Students should be given a variety of practical experiences ranging from fountain work to meal cooking. Portioning and arranging food attractively on a plate should be a part of this theme, while an emphasis on efficient work habits and cleanliness should be ongoing. Students must be kept aware of the importance of good sanitation and cleanliness.

Courses that focus on the theme of the duties of a waiter/waitress should include topics selected from units 42 through 47. Personal grooming should receive particular emphasis as a component of this theme. Writing and numerical skills should be reinforced to facilitate the recording and costing of orders.

Whenever possible, students taking Senior Division courses at the basic level of difficulty should be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students.

The performance objectives for apprenticeship outlined in the cook training profile (available through the Linkage program for this trade) may serve as supplementary curriculum content for courses based on this section. Information on this program is available from the directors of the regional offices of the Ministry of Education.

The training profile includes units on short-order items, table service, menu planning,

sanitation, safety, and equipment – all of which can be directly supportive of courses in restaurant services.

Work experience can benefit students at any point in their Senior Division course work – particularly when such experience develops the students' confidence in their ability to work independently on assigned tasks. Early experiences can help students to explore careers in the subject field, whereas later experiences can reinforce and further develop particular objectives of the course. All work experience, whether gained through co-operative education placements or through part-time work, can improve student chances for employment and career success after graduation.

Courses offered at the basic level of difficulty could include objectives that deal with business aspects of the subject in addition to skill development. These objectives could focus on development of an inventory of equipment appropriate to the efficient operation of a fast-food counter or small restaurant, or an investigation of some of the business aspects of owning and operating a small food service establishment. Such objectives, related to a theme of self-employment, could also be attempted as individual projects by students. All students should be encouraged to achieve at higher levels of difficulty in this program if they are able to do so.

General Level

Course codes assigned to general level courses planned under this section will be TFR3G for Grade 11 and TFR4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire confidence in their ability both to work responsibly on their own and to work with others in a courteous and businesslike manner;
- further develop skills in fast-food preparation and service in a restaurant;
- learn and practise safe working habits and develop a positive attitude towards the safe and correct use of equipment, materials, and protective clothing used in restaurant services;
- develop knowledge and understanding of, and skill in complying with, the requirements of relevant sections of the Public

Health Act and other legislation related to restaurant services as they apply to personal hygiene and sanitation of equipment, supplies, and work areas;

- develop problem-solving skills related to applications of food services technology;
- participate in work experience and/or co-operative education placement in the restaurant services industry;
- acquire knowledge of careers and further training opportunities in the restaurant services industry and a perspective on the place of this industry within the food services field.

Suggestions for Teachers

The performance objectives for apprenticeship outlined in the cook training profile (available through the Linkage program for this trade) may serve as supplementary curriculum content for courses based on this section. Information on this program is available from the directors of the regional offices of the Ministry of Education. The training profile for cook includes units on short-order items, table service, menu planning, sanitation, safety, and equipment – all of which can be directly supportive of courses in restaurant services.

Courses offered at the general level of difficulty may include, in addition to skill development objectives, objectives that probe technological, scientific, or commercial aspects of the subject. These may include, for example, cognitive objectives related to the different types of toxins, chemical poisons, and micro-organisms associated with food preparation (e.g., their effects and their control). Alternatively, additional objectives may

involve the exploration of possible fast-food products, and the equipment and supplies necessary to the efficient operation of a short-order food operation or small restaurant. An investigation of some of the business aspects of owning and operating a small food service establishment may also be undertaken as a project by students.

The use of themes can serve as an effective structure for the learning activities in all courses. These themes can relate to catered events at the school or to special holidays such as Christmas or Easter. Themes related to a particular emphasis in the course work (e.g., short-order cooking or the duties of a waiter/waitress) can be treated simultaneously with special-event themes.

Summary of Core Content for Courses in the Food Services Grouping

Chart 4.1.9

Content Units	Baking (Gr. 9-10)				Food Preparation – Commercial (Gr. 9-10)				Food Preparation – Domestic (Gr. 9-10)				Restaurant Services (Gr. 9-10)			
	(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)		(Gr. 11-12)	
	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen
1. Sanitation and trade regulations	a	ad	d	bc	a	ad	d	bc	a	ac	c	e	a	ad	d	bc
2. Safety	a	abc	ac	a	a	abc	ac	a	a	ab	ab	a	a	abc	ac	a
3. Basic shop practices	ab	ab	ad	ade	ab	ab	ad	ade	ab	abf	ab	abf	a	a	af	af
4. Planning of work			b	ab			b	abc		a		ac	b	ab	b	ab
5. Opportunities in the food services industry		b	be	d		b	be	d						b	be	d
6. Pastries	a	a	b	c			a	a			a	a				
7. Yeast goods	a	b	a	b							a	a				
8. Quick breads	a	a		b							a	a				
9. Cakes	a	a	b	c						a	a					
10. Cookies	a	a	b	c					a	a						
11. Fillings	a	ab	b	c					a	a		b				
12. Icing cakes	a	ab	b	c					a	a						
13. Basic stock					a	ab	b	ab				a				
14. Basic sauces					a	ab	c	d			a	a			a	a
15. Soup cookery					a	abc	bc	bcd	a	a	b	b			d	d
16. Egg cookery			a	a	a	ab	b	c	a	a	b	bc	a	ab	b	c
17. Fish					ae	ace	c	bd	a	a	d	de	a	a	c	ce
18. Potato cookery					c	bc	b	ad	b	b		a			c	c
19. Vegetable cookery					d	bd	c	ac	d	bd	c	ac			d	d
20. Meat cookery					be	abe	ag	gh	b	ae	ae	g	a	a	fh	edh
21. Farinaceous dishes					b	bc	bc	ad			b	bc				
22. Steam table					a	a							a	a		
23. Banquet preparation								a								d
24. Buffet preparation							b	bc								d
25. International dishes								a								
26. Diet cookery			a									a				
27. Basic nutrition			a	a			a	a			a	a				a
28. Grocery selection									a	a		b				
29. Storage and receiving			a				a					a				a
30. Meal planning										c	b	a				
31. Sandwich making									a	a			a	a		c
32. Salad preparation					a	a	b	b			a	a	a	a	b	b

Content Units	Baking (Gr. 9-10)				Food Preparation – Commercial (Gr. 9-10)				Food Preparation – Domestic (Gr. 9-10)				Restaurant Services (Gr. 9-10)			
	(Gr. 11-12)															
	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen
33. Grilling procedures					ab	abc	c						ab	abc	c	
34. Deep-fat procedures					b	a	c	c					b	a	c	cd
35. Fountain service													a	ab	b	c
36. Breakfast cookery						a	a	ab		a	a	c		a	a	ab
37. Order taking and serving												a	ab	b	c	
38. Microwave cookery							a									a
39. Retail meat cutting																
40. Storage of goods and meat							a									
41. Freezing techniques			b				a									
42. Table set-up									a	a	a	b	a	a		b
43. Customer contacts																a
44. Types of service																a
45. Menu knowledge																a
46. Preparation of work stations															a	
47. After-service duties													a	a		b
48. Preparation of portable foods										b	ab					
49. Entertainment											a					
50. Food management			a				a									a
51. Canada's Food Guide			a	a	a	a			a	a					a	a
52. Dishwashing procedures					a	a			a	ab	a		a	a	a	
53. Soft desserts		a	a						a	a						
54. Non-alcoholic beverages									a	a			a	a		
55. Dairy products		a	a		a	a			a	a			a	a		
56. Fruit preparation			a	b			a	b			a	b				a
57. Preserving																
58. Candy making																
59. Garnish					a	a			a	a			a	a		
60. Poultry cookery					a	ab	b		a	a	b					

See "Course Content for the Food Services Grouping", beginning on page 36, for description of the subunits a, b, c, etc.

Course Content for the Food Services Grouping

1. Sanitation and trade regulations	<ul style="list-style-type: none">a) Handling and storing food; disposing of refuse; personal hygiene; grooming and proper dress; sanitation codes;b) relevant sections of the Public Health Act and the Food and Drug Act; causes and effects of food poisoning;c) food poisoning and foreign matter;d) cleaning materials and pesticides – chemical content of detergents and pesticides, uses and limitations, disease-carrying insects, scheduling application of pesticides;e) safe use and storage of domestic cleaning materials.
2. Safety	<ul style="list-style-type: none">a) Causes and prevention of accidents; precautions in using tools, utensils, and equipment;b) fire safety;c) using chemicals;d) using metal-meshed glove when cutting meat.
3. Basic shop practices	<ul style="list-style-type: none">a) Identifying and using basic ingredients, tools, equipment, and utensils; cleaning tools, utensils, equipment, and working areas;b) weighing and measuring liquid and dry ingredients; reading and following recipes;c) food terminology;d) identifying and using ingredients; converting recipes to smaller and/or larger quantities;e) common decorating and garnishing techniques;f) packaging and wrapping techniques.
4. Planning of work	<ul style="list-style-type: none">a) Time management in food preparation; serving; holding;b) portion control;c) costing; purchasing.
5. Opportunities in the food services industry	<ul style="list-style-type: none">a) Food occupations; job classifications;b) careers in the food industry;c) the Linkage program;d) apprenticeships, college courses, qualifications required for specific courses;e) apprenticeship.
6. Pastries	<ul style="list-style-type: none">a) Pie dough; sweet paste;b) puff paste goods;c) fancy pastries; puff pastry products; choux paste (e.g., éclairs, cream puffs).

7. Yeast goods	<ul style="list-style-type: none">a) Breads, rolls; straight doughs;b) variety fermented goods – doughnuts, buns, Danish pastries;c) variety breads – sourdoughs, sponge doughs, rye, egg, cheese, French breads.
8. Quick breads	<ul style="list-style-type: none">a) Tea biscuits; muffins;b) fruit loaves; cake doughnuts.
9. Cakes	<ul style="list-style-type: none">a) Preparing batters – butter cakes, sponge cakes, fruit cakes; garnishing and serving cakes;b) variety cakes – sponge cakes, angel cakes, chiffon cakes;c) cake theory – types, methods, cake faults; garnishing and serving cakes.
10. Cookies	<ul style="list-style-type: none">a) Rolled; bagged; cut; dropped;b) fancy cookies – bagged filling and decorating;c) meringue goods; macaroons.
11. Fillings	<ul style="list-style-type: none">a) Using prepared fillings;b) custard-type fillings; syrup fillings;c) preparing from fresh, frozen, and canned fruit; using various starches.
12. Icing cakes	<ul style="list-style-type: none">a) Preparing and using butter icings (butter creams); manipulating palette knives, piping bags, and decorating tubes;b) decorative icings – butter creams, glacé royale fondant; constructing paper cornet; using turntable;c) decorating – lettering, borders, flowers from icing and marzipan, chocolate couverture.
13. Basic stock	<ul style="list-style-type: none">a) Preparing ingredients; cooking stocks – brown stock, white stock, fish stocks;b) handling stocks; cooling and storing stocks; using stocks.
14. Basic sauces	<ul style="list-style-type: none">a) Categories of sauces; preparing mayonnaise, velouté, cream, brown, and tomato sauces from commercial base;b) various types of thickening agents (e.g., roux); straining, passing, and finishing various types of sauces;c) preparing mayonnaise;d) specialty sauces as derivatives of all basic sauces; non-derivative sauces.

15. Soup cookery	<ul style="list-style-type: none">a) Preparing, cooking, and clarifying soup;b) cream soups and veloutés; thickening agents; mixing, blending, and cooking; purées, pulses, and potages;c) serving soups – hot, cold, and chilled;d) variety soups, special soups, international soups, various garnishes for soups, fruit soups.
16. Egg cookery	<ul style="list-style-type: none">a) Uses of eggs; sizes, grading, and storing;b) preparing poached, boiled, and scrambled eggs;c) omelettes – making, filling, and folding all varieties;d) other egg dishes.
17. Fish	<ul style="list-style-type: none">a) Types of fish (fresh and salt water);b) handling and storing fish;c) various methods of cooking fish – breading and in-batter procedures;d) fish dishes;e) types of shellfish;f) storing and preparing shellfish; cooking methods; various dishes.
18. Potato cookery	<ul style="list-style-type: none">a) Qualities and types of potatoes;b) preparing for different methods of cooking;c) uses of frozen or canned potatoes;d) various potato dishes.
19. Vegetable cookery	<ul style="list-style-type: none">a) Varieties of root and green vegetables;b) care, handling, and storage of fresh vegetables;c) preparing for different methods of cooking;d) uses of frozen or canned vegetables.
20. Meat cookery	<ul style="list-style-type: none">a) Types of meats and cuts;b) braises and stews;c) poaching, boiling, and steaming;d) sautéing and pan frying;e) ground-meat entrées;f) deep frying;g) roasting;h) barbecuing and grilling.
21. Farinaceous dishes	<ul style="list-style-type: none">a) Varieties of pasta; preparation;b) farinaceous cooking – noodles (pasta);c) cooking methods for rice;d) cooking methods for other cereals.
22. Steam table	<ul style="list-style-type: none">a) Set-up and care of hot- and cold-food sections.

23. Banquet preparation	<ul style="list-style-type: none">a) Planning menus; ordering and purchasing foods; controlling portions;b) storing cooked and raw foods (refrigerator management);c) specialized banquet equipment;d) set-up and service procedures.
24. Buffet preparation	<ul style="list-style-type: none">a) Selecting foods (taste, colour, texture, etc.); types of clientele; occasion or theme;b) preparing and presenting cold meats and salads;c) decorating and garnishing; chaud-froid set-up and service procedures;d) chafing dish procedures.
25. International dishes	<ul style="list-style-type: none">a) Background information on and preparation of national and classical dishes; different ways of serving these dishes.
26. Diet cookery	<ul style="list-style-type: none">a) Clear fluid diets; fluid diets; soft diets;b) geriatric nutritional requirements;c) nutritional requirements of young children; restricted-calorie diets; special diets.
27. Basic nutrition	<ul style="list-style-type: none">a) Food groups – starches, sugars, fats, and proteins; vitamins; minerals; water.
28. Grocery selection	<ul style="list-style-type: none">a) Guides to buying fresh, frozen, dried, reconstituted fruits, vegetables, meats, dry goods, and dairy products;b) food costing and quality.
29. Storage and receiving	<ul style="list-style-type: none">a) Dry storage; refrigeration; freezing temperatures; type of freezer wrap; storage times.
30. Meal planning	<ul style="list-style-type: none">a) Nutritional values of foods; selecting and purchasing food;b) organizing time and energy;c) foods for special occasions – breakfast, lunch, dinner.
31. Sandwich making	<ul style="list-style-type: none">a) Buttering bread; preparing spreads; fillings; seasonings; garnishes; wrappings;b) correct storage procedure and marketing skills;c) variety sandwiches – origins and types, types of bread and buns; organization and layout of sandwich stations for volume production.

32. Salad preparation	<ul style="list-style-type: none">a) Cleaning and preparing raw ingredients; varieties of fruits and vegetables for side salads and main courses;b) specialty salads – desserts, main course, gelatin salads, garnishing; buffet preparation; arranging and serving.
33. Grilling procedures	<ul style="list-style-type: none">a) Tools used; correct temperatures; types of fats and oils; types of grills;b) cleaning and conditioning grills;c) preparing and grilling foods.
34. Deep-fat procedures	<ul style="list-style-type: none">a) Types of fryers and accessories; standard frying procedures;b) preparing for breading; applying batter;c) frying; frying temperatures; fats and oils – types, filtering, breakdown, and changing;d) extra safety procedures.
35. Fountain service	<ul style="list-style-type: none">a) Toppings and syrups; ice cream and sherbets – types, handling, and garnishing; sodas;b) floats and frappés; ades, freezes, and colas;c) specialty sundaes and parfaits; à la carte ice cream orders.
36. Breakfast cookery	<ul style="list-style-type: none">a) Egg cookery;b) care and use of griddle and waffle irons; waffles and pancakes – methods and types;c) breakfast meats – frying, broiling;d) toasts – French, cinnamon, plain.
37. Order taking and serving	<ul style="list-style-type: none">a) Taking and writing up orders; sequence of serving; setting up and cleaning; bussing and stacking dishes;b) dining-room service – types of service (French, Russian, etc.), reception and hosting activities, banquets;c) dealing with accidents and unruly guests; assisting the handicapped, the elderly, and children.
38. Microwave cookery	<ul style="list-style-type: none">a) Uses; timing; containers; cleanliness; safety; preparing individual dishes and complete meals.
39. Retail meat cutting	<ul style="list-style-type: none">a) (Includes beef, pork, veal, lamb, poultry, fish, and variety meats.) Deboning hinds, sides, fronts; trimming and preparing roasts; portion cut meat (steaks, etc.); packaging and wrapping techniques; counter layout and display; weighing, pricing, and selling.

40. Storage of goods and meat	a) Storing all goods, meats, poultry, and fish – fresh and frozen; rotating stock.
41. Freezing techniques	a) Care of surplus meats, poultry, and fish; care and storage of frozen meats, poultry, and fish; freezing techniques – temperatures, containers; b) care and freezing of raw and baked pastries, cakes, and yeast goods; holding time for yeast goods.
42. Table set-up	a) Pre-set-up; linens and silver; settings – informal, buffet, and formal; b) table covers, draping, types of cutlery, settings – breakfast, luncheon, dinner, settings for various types of service; napkin folding.
43. Customer contacts	a) Greeting and seating guests; presenting menus; taking, writing, filling, and serving (timing) orders; dealing with accidents, unruly guests, children, and complaints; familiarizing guests with house rules.
44. Types of service	a) Table, booth, counter, tray, cafeteria, American, French, Russian, English, buffet.
45. Menu knowledge	a) Terminology; choices and prices; selling techniques.
46. Preparation of work stations	a) Setting up stations and side stands; knowledge of accompaniments.
47. After-service duties	a) Presenting cheques; taking cash, credit cards; personal touches and finesse; clearing tables; b) point-of-sale duties – handling cheques, receiving payment (cash, cheques, credit cards); cashiering security.
48. Preparation of portable foods	a) Party foods; picnic lunches; barbecue cooking; b) packing a lunch for school or work.
49. Entertainment	a) Party planning for showers, birthdays, etc.; invitations; thank-you's.
50. Food management	a) Business practices; costing; accounting; storage, receiving; kitchen organization; production efficiency programs; staff relations; menu planning; public relations; stock records.
51. Canada's Food Guide	a) Availability; interpretation; application.

52. Dishwashing procedures	a) Machine temperatures for washing and rinsing; scraping; prerinsing; washing; racking; drying; stacking; storing; checking condition of crockery or china, glassware, and cutlery; b) manual procedures.
53. Soft desserts	a) Gelatines; egg desserts; baked puddings.
54. Non-alcoholic beverages	a) Making tea, coffee, hot chocolate, and other hot drinks; making various cold drinks – iced tea, punch, lemonades.
55. Dairy products	a) Types (milk, cheese, yogurt, etc.), quality, storage, uses.
56. Fruit preparation	a) Types of fruit and their categories, storage, preparation; b) fruit in meals and desserts.
57. Preserving	a) Selecting and preparing fruits and vegetables for pickles, sauces, and fruit preserves; various preserving and safe storage methods.
58. Candy making	a) Fudge, toffee, chocolate couverture, pulled sugar, marzipan fruits.
59. Garnish	a) For appetizers and main courses, including egg, meat, fish, and farinaceous dishes.
60. Poultry cookery	a) Various types of cooking methods; b) various dishes for the different types of poultry.

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
4. Food Services Grouping	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
5. Graphics Grouping	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
3. Electrical Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
4. Food Services Grouping	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
5. Graphics Grouping	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMJ
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Baking (Grades 9-12)

Food Preparation – Commercial (Grades 9-12)

Food Preparation – Domestic (Grades 9-12)

Restaurant Services (Grades 9-12)

Curriculum Guideline

Publication

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*5. Graphics
Grouping*

Module 1, 1986



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Introduction to the Graphics Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, *Part B*, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. *Part A* provides essential background for the planning of all courses in technological studies. The following three sections are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of *Part B* are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in *Part B* is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the graphics grouping. The grouping includes five subjects: drafting, blueprint reading and sketching, graphic communications, photography, and vocational art. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, such enrolment will be their initial introduction to one of the occupational areas within the graphics grouping. For some, it will be the first step towards an apprenticeship as a printer. For others, it will be an introduction to other occupations in the graphics industry, such as drafting or photography. For many, it will lead to postsecondary studies. While each of the five subjects outlined in this document deals with content that is unique, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses under any of these five subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic, general, and/or advanced level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills and

knowledge outlined as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

While in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific objectives, which should be based on the aims for courses at the basic, general, and advanced levels. The nature of the aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Graphics Grouping", at the end of this module, or from the course content listed at the end of any other module in *Part B*.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the graphics grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Graphics Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 5.1.7 provides a summary of the core content for all courses in the graphics grouping. This summary chart is intended to provide a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Graphics Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the electronics section in the electrical component may be incorporated into the drafting program if appropriate to a particular theme or project.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in graphics, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 drafting, general and advanced levels)

or at different grade levels (e.g., photography, Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students develop these skills, they are motivated to acquire related knowledge and the attitudes they will need to apply their skills in work situations. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is producing a particular drawing or performing a particular photographic service. Significant aspects of the completed product or service are identified and commonly assessed with rating scales.

When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in graphics courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's progress on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions relating to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained through these experiences is particularly important to young people, who can expect to face a working life characterized by changing technology and the constant need to update their skill and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should also have opportunities to become aware of the various tasks that computer technology performs in the graphics industry. Visits to engineering and architectural design establishments can introduce students to the uses of CAD (computer-aided design) systems on both specialized and comprehensive work projects. Visits to commercial printing establishments can provide insights into the applicability of computer technology to a wide range of operations and production tasks in the graphic communications industry.

Drafting

Intermediate Division

(Grades 9 and 10)

Drafting (engineering graphics) is commonly referred to as "the language of industry". Every manufactured object originates from a set of working drawings, made up of appropriate views, dimensions, standardized symbols, and notes. These drawings provide the shape, the size, and all the other information necessary to produce the object – be it a small machine part, a jet aircraft, or a structure such as a house. Along with drawings that show physical shape, drafting includes drawings that convey information about systems, such as wiring diagrams and piping layouts. These drawings are known as *schematic diagrams* or *systems drawings*.

Drafting is as diverse as the many fields of technology that it serves. In mechanical, electrical/electronic, and architectural technology, for example, drafting provides the communications link between those who originate a concept and those who produce the finished product.

Drafting courses in the Intermediate Division will focus on fundamentals. Students will learn to letter and draw neatly, to interpret and use various kinds of lines, to produce an orthographic projection as well as a pictorial drawing, to use dimensions, symbols, and notes, and most important, to visualize shapes drawn in orthographic projection and interpret a moderately complex blueprint.

Students who study drafting in the Intermediate Division may do so for a variety of reasons. For some, it may be a step towards the study of drafting in the Senior Division, the eventual goal being employment in a drafting office. For others, the skills and knowledge

derived from a drafting course may be applied in a postsecondary program in technology or engineering. All will acquire the fundamentals necessary to understand and produce graphic communication of technical information.

The advent of the computer has added a new and exciting dimension to the field of drafting. The drawing board and the instruments associated with it will eventually be replaced by the computer, and some of the skills that are essential for producing a drawing today will be replaced by computer skills. The speed with which computer-aided design (CAD) will replace the traditional method of producing technical drawings is difficult to predict. It is important, therefore, that students are made aware of this transition and gradually introduced to computers and the concepts of CAD.

Courses in drafting are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 5.1.1 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to basic drafting skills and equipment, orthographic projection, dimensioning, and sectional views.

Chart 5.1.1
Core Content for
Drafting
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses		
	Basic	General	Advanced
1. Graphics industry	a	ab	abc
2. Introduction to drafting	a	ab	abc
3. Basic drafting skills and equipment	a	ab	abc
4. Geometric construction	a	ab	abc
5. Orthographic projection	a	ab	abc

Content Units	Core Content for Courses		
	Basic	General	Advanced
6. Sketching techniques	a	ab	abc
7. Dimensioning	a	ab	abc
8. Drawing conventions and interpretation	a	ab	abc
9. Sectional views	a	ab	abc
10. Auxiliary views		a	ab
11. Types of drawings and standards	a	ab	abc
12. Pictorial drawings	a	ab	abc
13. Systems drawings	a	b	ab

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TDR1B for Grade 9 and TDR2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits;
- develop the ability to work in a neat, clean, and orderly fashion;
- learn to read and understand a moderately complex blueprint;
- understand the importance of drafting as the basic form of communication in the field of technology;

- develop the ability to follow written instructions;
- develop the skills necessary to create a technical drawing within a limited period of time;
- learn how to acquire information from tables displaying technical data;
- develop the ability to visualize in a three-dimensional form a shape shown in a two-dimensional drawing;
- develop the ability to plan and produce a technical drawing.

Suggestions for Teachers

The programs for Grades 9 and 10 are designed to provide students with a broad range of experiences in various technical areas within the school. Drafting should be introduced as the form of communication common to all these areas. Teachers should attempt to select drawing projects that illustrate this feature of drafting.

In planning drafting courses for students studying at the basic level of difficulty, it is important that teachers recognize learning problems that are common to many of these

students. These problems include personality traits that can affect their learning adversely. Students are embarrassed when put in a position that exposes their learning problems. Poor readers would rather not be asked to read in front of the class. Encouragement can profoundly affect the student's enjoyment of the subject and respect for the teacher.

Courses at the basic level of difficulty should emphasize practical activity and skill development at an operational level. Differing degrees of emphasis and reinforcement may be

necessary for the various core units, depending on the individual needs of the students and the employment opportunities in the community. Units 2 to 6 and unit 11 should receive the greatest emphasis in basic level courses.

Drafting tends to be abstract and to have a paper orientation. This academic aura poses special demands for the teacher working with students at the basic level. The following strategies are suggested to help maintain student interest and enhance attention span:

- It is vital to develop a positive self-image in the student. Projects must be challenging yet within the capabilities of the students. For this reason, it is desirable to assign several similar projects at increasing levels of challenge. Students can then build on their successes. Teachers can also facilitate success by using smaller units and by taking a careful, step-by-step approach.
- Where possible, projects should relate to things that students are familiar with in everyday life. Projects related to other subjects, technical or otherwise, should be sought. Skills and knowledge from mathematics, science, and English should be reinforced whenever possible.
- To provide a change of pace, formal drafting can be interspersed with units of blueprint reading and sketching.
- Construction of simple geometric solids can assist students in developing their visualization skills. Students can be assigned the task of creating a model from an orthographic sketch. Use of cardboard,

styrofoam, or some other model-building material is an interesting change from the pencil-and-paper work normally associated with the subject.

- Actual samples of tools, fasteners, and other components being discussed or drawn should be presented whenever possible.
- Missing-line and completion exercises can be conducted as games (the class perhaps being split into teams).

At the basic level of difficulty, the teacher should attempt to mark each drawing in the student's presence. Using this technique, the teacher can both point out features of the drawing that should be improved and, at the same time, praise those features that were done correctly. Evaluation requires sensitivity if the student's motivation in the subject is to be maintained; the results of evaluation can be positive, but if the process is too severe the student can be completely discouraged and develop a negative attitude towards the subject. Drafting requires a relatively high degree of neatness, which is uncommon in teenagers. Neatness can be developed through the evaluation process, but the teacher must take a patient approach.

It is wise to introduce skills gradually over several assignments. As students master the skills, they can progress from simple to more complex drawings. From 70 to 80 per cent of the student's final mark should be based on these drawings, with scores on short tests making up the rest of the mark.

General Level

Course codes assigned to general level courses planned under this section will be TDR1G for Grade 9 and TDR2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards their capabilities and a sense of satisfaction in their accomplishments;

- develop the skills necessary to create a neat, accurate drawing involving a moderate amount of detail;
- develop an appreciation for the importance of drafting as a form of communication;

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- develop the ability to visualize the shape of an object from an orthographic projection;
 - develop the ability to carefully check and criticize their own drawing before considering it complete;
 - develop a general knowledge of how symbols, notes, and a wide range of drafting conventions are used in producing a drawing;
 - reproduce a drawing;
 - learn the significance of the advent of computer-aided design (CAD) and computer-aided manufacturing (CAM) equipment;
 - acquire knowledge of the career opportunities in the various fields of drafting.

Suggestions for Teachers

Intermediate Division courses are intended to be exploratory in nature. Grade 9 courses should introduce students to drafting skills and knowledge through both mechanical and architectural applications. However, where sufficient time is allocated to a Grade 10 course and the required core learning is adequately covered during the course, one or more themes concentrating on a particular drafting specialty may be included as optional content.

Courses in drafting at the general level of difficulty should enable students to acquire the basic knowledge and skills they require in order to extend their learning in the subject field. An appropriate balance between theoretical and applied activity is necessary if the course is to achieve this; applied activity should occupy 60 per cent to 70 per cent of the course time.

Once the core content has been covered sufficiently to fulfil the objectives of the course, the core topics may be augmented through in-depth projects and additional lessons, which will broaden the students' knowledge of the subject. Additional topics related to drafting techniques, such as paste-up drafting, technical illustrations, topographic drawings, graphs, and charts, may also be introduced. Alternatively, additional units related to, for example, design concepts or development drawings can be explored.

Depending on the teacher's background and the needs of the students, additional content material may be derived from other subject areas. For example, technical illustrations can be studied in conjunction with the art department, or cut-and-paste drafting in conjunction with the graphic arts department.

Special topics suitable to design projects may be derived from other subjects in the technological studies guideline (e.g., trowel trades, applied electricity, or heating, refrigeration, and air conditioning).

The applications of the computer in engineering graphics offer numerous avenues for exploration. Students should be made aware of the broader aspects of computer-aided design (CAD) in engineering graphics and of computer-aided manufacturing (CAM) in manufacturing. It is important for students to realize that a mastery of the conventions governing symbol, line, and information combinations is fundamental to using sophisticated CAD systems. Students should also be shown the increasing impact that the computer is having on the world of manufacturing. It is possible to relate the fundamentals of CAD to the graphics potential of computers already found in schools. Relevant literature at an introductory level, along with illustrations, can provide an informative series of tackboard displays. Visits to firms can provide practical examples of CAD and CAM processes in action.

One way to expand the scope of the curriculum is to introduce a few research assignments in Grade 10 courses. These can be planned to require students to look at broad topics such as processes in manufacturing and construction or developments in technology. At this stage it is important that the teacher give explicit instructions on how such assignments should be carried out (breadth of study and presentation of findings); the research experience is part of the learning process. Particular assignments can be outlined in detail, with information sources indicated.

Blueprint-reading exercises provide excellent feedback on the extent to which students have learned the graphic language. Handled well, they can be used as non-threatening tests for areas of weakness that require further instruction. A number of excellent texts on reading engineering drawings are on the market, and some drafting texts include blueprint-reading exercises. Some teachers prefer to make up their own blueprints based on drawings similar to those done in class. Inserted at appropriate times throughout the course of study, these exercises not only provide feedback but also offer a change of pace. Most important, blueprint-reading exercises provide an insight into the other dimension of the formal drawing process: the need of the user to read the drawing.

Evaluation of student achievement is a teaching process. Assessment of the student's drawings allows the student to see the things he or she is doing correctly as well as incorrectly. With this in mind, it is important for teachers to mark the drawings as soon as possible, so that mistakes are not repeated. Students studying at this level of difficulty should be assessed on the theoretical aspect of the subject with short tests covering material that has been taught recently. The practical work should make up approximately 70 per cent of the student's final mark.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TDR1A for Grade 9 and TDR2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, a capability for critically evaluating the results of their own work, and a sense of satisfaction from what they achieve;
- develop the capability for clear and creative thinking;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop an attitude of respect towards, and co-operation with, fellow workers and supervisors;
- develop an increasing awareness of self and of personal capabilities;
- learn to communicate information concisely and accurately by means of technical drawings and sketches;
- read and interpret a variety of technical drawings in order to understand how drafting functions as a universal form of communication;
- produce detail and assembly working drawings of objects and mechanisms in single-view, multi-view, and pictorial representations;
- lay out floor plans using basic architectural symbols and conventions to various scales;
- acquire basic skills in drafting schematics (e.g., electrical/electronic circuitry, process piping, and hydraulics systems);
- use reference charts and manufacturers' data as required in drafting projects;
- explore various engineering and production processes fundamental to the projects undertaken, with emphasis on the theoretical aspects, in order to gain a wider view of the world of technology;
- research topics in engineering and technology and prepare reports on them;
- acquire a perspective on the many ways in which engineering graphics (including developments in CAD) play a vital role in technological careers, and develop career awareness that motivates further exploration, especially at the university level.

Suggestions for Teachers

Courses at the advanced level of difficulty should place increased emphasis on the theoretical aspects of the subject (up to 50 per cent of the course time).

It should be very clear to students how the evaluation process is structured and marks compiled.

Many of the students taking drafting at the advanced level will probably undertake further education at a college or university in the fields of technology, engineering, and science. Computer applications in design and manufacturing will be of considerable interest to them. Computer-aided design and manufacturing can be a theme for very productive investigation. Students should be made aware that their knowledge of the conventions of drafting can be fundamental to doing more sophisticated work with a CAD system at a tertiary level of education.

Problems involving intersections introduce challenges that should be of special interest to students working at the advanced level. As well as reinforcing the powers of spatial visualization, they extend projection skills and introduce some fundamental concepts in solid and descriptive geometry.

Research assignments can be especially fruitful for students working at the advanced level. These can be used to explore particular processes, the function and operation of various mechanisms, particular materials, careers, and so forth; the possibilities are limited only by the imaginations of student and teacher. Such assignments are an ideal way to expand the scope of a course and to investigate areas that couldn't otherwise be included because of the constraints of time. Reports can include illustrations, drawings, and charts. Research assignments that involve drafting add to a student's inventory of useful skills a vehicle for communication that should prove important in future years. If the research report is a combination of illustrations and written material, then the student's English teacher may assist the student with the written portion.

Fullest advantage can be gained from research assignments when students are given brief information sheets containing suggestions on how to go about the process and ideas for making their reports interesting and meaningful. The teacher can help by being directive and preparing a file of topic sheets on specific themes. Each sheet should contain suggestions about things to look at, questions to answer, items and ideas to include, and resources to consult. Of course, some students with imagination and particular interests may wish to pursue topics of their own choice and should be encouraged to do so if the topics are appropriate to the course.

To assist in the growth of students' organizational abilities, teachers should encourage students to maintain a neat and orderly notebook. Information and project sheets can be filed in the notebook with related drawings. The notebook can also include research assignments and clippings of articles and illustrations related to technology and engineering. Students should be encouraged to keep this "resource manual" during Grades 11 and 12. A well-kept notebook can impress a prospective employer.

Technical sketching is a skill that has frequently been omitted from drafting courses. Students often find it a very useful method of conveying information. It is also a very convenient way of developing ideas and helping students to visualize shapes. For these reasons it has been included in the core content and should be treated as an important and significant unit. In developing this skill, time constraints should be imposed so that the students learn to make neat sketches quickly.

Students studying at the advanced level of difficulty should be evaluated on the basis of their drawings, written tests, and an individual project requiring some research. The drawings should make up approximately 50 per cent of the final mark, the test 30 per cent, and the research assignment 20 per cent.

Drafting

Senior Division

(Grades 11 and 12)

Courses in drafting are authorized for the Senior Division (Grades 11 and 12) in the specialized fields of architectural, electrical, and mechanical drafting as well as in comprehensive drafting. The authorized levels of difficulty and the curriculum guidelines on which these courses will continue to be based are as follows:

Drafting – Architectural, offered at the general and advanced levels of difficulty, is based on *Elements of Construction Technology, Senior Division, 1969*.

Drafting – Electrical, offered at the general and advanced levels of difficulty, is based on *Technical Subjects RP-27, Intermediate and Senior Divisions, 1963*.

Drafting – Mechanical, offered at the general and advanced levels of difficulty, is based on *Elements of Mechanical Technology, Senior Division, 1969*.

Drafting – Comprehensive, offered at the basic, general, and advanced levels of difficulty, is based on two or more of the above guidelines. Students taking comprehensive drafting who demonstrate particular abilities in any of the specialized fields mentioned above should be encouraged to pursue them

as themes. Other specialized drafting fields (such as survey drafting) may also be included in comprehensive drafting courses.

When planning courses for the Senior Division, teachers may include additional topics from the units listed under “Course Content for the Graphics Grouping” (starting on page 40) or from any other subject grouping in Part B of the technological studies guideline. Courses in this subject area will have the initial three letters TDA for architectural, TDE for electrical, TDM for mechanical, and TDG for comprehensive drafting as the stem of the course codes.

It is important to make students aware of the growing use of computer-aided design equipment in drafting offices. The gradual introduction of microcomputers and CAD software into the drafting classroom should be seriously considered. The advent of this new technology will mean major changes in the skills and knowledge necessary to produce a drawing. This does not mean, however, that a total conversion to CAD techniques should be undertaken, for graduates applying for a position in a drafting office will still be expected to have the traditional drafting skills.

Blueprint Reading and Sketching

Intermediate Division

(Grades 9 and 10)

Blueprint-reading and -sketching courses in the Intermediate Division introduce students to an essential aspect of the communication process in technological studies. In the broader educational context, these courses can also support the following goal of education (listed in Part A): helping each student to acquire the basic knowledge and skills needed to comprehend and express ideas through words, numbers, and other symbols. Whereas drafting programs prepare students to express technological ideas in a graphic form, blueprint-reading and -sketching programs prepare the student to comprehend and interpret those graphic representations. The blueprint is a common mode for communicating relatively complex technical information to the skilled tradesperson.

The training specifications for many trades include a component of blueprint reading. Examples of such trades within the provincial Linkage program are: general machinist, millwright, and appliance repair. Because the complex ideas and concepts related to such trades need to be expressed accurately in as simple a format as possible, a symbolic language peculiar to each trade area has developed. By replacing ordinary verbalization,

symbols save space and time and reduce the potential for misinterpretation.

Blueprint-reading and -sketching courses in the Intermediate Division focus on the fundamentals of mechanical-drawing interpretation, primarily as it relates to the general machinist's trade. The concepts that are developed under this approach cross most trade boundaries. The learning experiences for students can therefore be planned to achieve the initial blueprint-reading objectives specified in the various Linkage profiles; to reinforce the learning in another subject, such as metal fabrication or woodworking, that may be taken simultaneously; or to develop skills in solving blueprint-related problems. These last-mentioned problems are often used by employers to assess job applicants.

Courses in blueprint reading and sketching are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 5.1.2 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow.

The courses may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 5.1.2
Core Content for
Blueprint Reading
and Sketching
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General / Advanced
1. Graphics industry	a	ab
5. Orthographic projection	a	abc
6. Sketching techniques	a	ab
7. Dimensioning	ac	ac
8. Drawing conventions and interpretation	a	ab
9. Sectional views	ab	abc
12. Pictorial drawings	a	ab
13. Systems drawings	a	ab
71. Reading mechanical engineering prints	a	a

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TDB1B for Grade 9 and TDB2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop confidence in their ability to interpret a unique, technical communications medium – the blueprint;
- develop a positive attitude towards efficient and effective work habits in problem solving;
- develop planning, organization, and research skills in problem solving;
- develop an appreciation for reading and arithmetic skills as tools for solving blueprint-reading problems;
- develop an appreciation for sketching as an aid to problem solving and communication;
- develop an awareness of scale and proportion and an appreciation for the need to be both neat and precise when communicating technical information;
- develop an awareness of and an appreciation for the concept of craftsmanship;
- explore and rationalize a variety of manufacturing methods and processes;
- use a variety of charts and manufacturers' data to interpret and define problems;
- acquire an understanding of how blueprint-reading skills are applied in various occupations.

Suggestions for Teachers

The subject of blueprint reading and sketching has a specific core of knowledge that must be mastered before the student can effectively explore the variety of trade areas encompassed by the discipline. In Intermediate Division courses at the basic level, students can be expected to require approximately 110 hours to master this material.

Ideally, courses in blueprint reading and sketching will be taken by students in the Intermediate Division as part of a broader technology package. While the core topics in blueprint reading focus on mechanical applications (paralleling topics outlined in the general machinist training profile for the Linkage program), teachers are encouraged to develop the sketching component of their courses in conjunction with other technology subjects the student may be taking. This cross-trade integration of blueprint reading and sketching is important for students at the basic level because it:

1. reinforces concepts being developed in other trade areas;
2. reduces the abstraction for students who find it difficult to deal with concepts outside the area of immediate need;

3. provides a relevant focus for reading and arithmetic problems.

In planning courses at the basic level, it is important to recognize the personal characteristics of the students that may interfere with learning. Students may show deficits in the areas of self-image, learning ability, attention span, social skills, attitude, and physical/emotional condition. Any one student can experience problems in any combination of these areas. A class of such students imposes formidable challenges that must be met if learning is to take place. Courses at the basic level should emphasize practical activity, variety, and skill development at the operational level. Differing degrees of emphasis and reinforcement may be necessary for the various core units, depending on individual needs of the students and employment opportunities in the community. Units 1 ("Graphics industry"), 5 ("Orthographic projection"), 6 ("Sketching techniques"), and 8 ("Drawing conventions and interpretation") should receive the greatest emphasis in basic level courses. Treatment of unit 13 ("Systems drawings") should be limited to a discussion of thread specifications.

While blueprint reading and sketching does not have the high degree of abstraction a drafting program normally has, it is nevertheless paper oriented and largely sedentary in nature. This academic aura places special demands on the teacher working at the basic level.

Some strategies that grow out of the suggestions presented in this section are the following:

- Scale models should be used as an aid to blueprint reading and sketching wherever possible.
- Sketching projects should be related whenever possible to things the students are familiar with in everyday life. Projects developed in conjunction with other subjects, technical or otherwise, should be sought.
- Variety is important. Blueprint reading should be interspersed with sketching in as imaginative a way as possible.
- Success breeds success. A variety of assignments at the same degree of difficulty may be required for the student experiencing a great deal of difficulty. Small units, carefully developed step by step, can lead the student to success. It is vital for students to develop a positive self-image.
- Abstractions should be minimized. Tools, fasteners, and components should be illustrated by actual samples wherever possible.

General Level

Course codes assigned to basic level courses planned under this section will be TDB1G for Grade 9 and TDB2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop an appreciation for the importance of the blueprint as a communications link between the idea and the finished product;
- develop the visualization skills necessary to understand the shape of an object from an orthographic projection;
- develop techniques of sketching as an aid to problem solving and communication;
- develop an appreciation of the importance of blueprint-reading skills for estimating;
- use a variety of charts and manufacturers' data to interpret and define problems;
- be made aware of the various occupations that require blueprint-reading skills;
- become familiar with the variety of manufacturing methods and processes, such as casting and machining;
- develop a sense of accuracy when checking, or making calculations from, information derived from a technical drawing.

Suggestions for Teachers

Blueprint reading and sketching, like most other technological studies taken at the general or advanced level, can be considered as having a spiral development in which a specific core of knowledge is developed early and is reinforced and further developed in a planned way as the course proceeds. More specifically, the knowledge outlined as core content must be mastered before any student can be expected to attempt the more complex problems developed at the Senior Division level.

Mastery of the core topics is also necessary before the student can be expected to explore the variety of trade areas encompassed by the discipline. The required core content of the general level blueprint-reading and -sketching course can be mastered in 110 hours of class time.

Ideally, courses in blueprint reading and sketching are taken by students as a component of a broader technology package.

The training profiles for several trades in the Linkage program (such as general machinist, millwright, and appliance repair) include blueprint-reading objectives similar to those indicated in the core learning for this section.

Teachers who are planning courses based on this section are encouraged to develop both the sketching and the interpretation aspects of the course to support other technological subjects the students may be taking. This cross-trade integration of technological studies should enable the student to:

1. understand more fully technological concepts developed in other trade areas;
2. receive credit for part or all of the performance objectives related to blueprint reading for the Linkage programs in particular trades;
3. develop an understanding of the need for good reading and arithmetic skills in an applied technology setting;

4. become aware that a skilled tradesperson must develop a package of skills, one of which is blueprint reading and sketching.

Some strategies that can facilitate the above objectives are the following:

- Sketching projects should relate as often as possible to other trade areas in which students are involved.
- Variety is important; blueprint-reading problems should be interspersed with sketching problems in imaginative ways.
- Abstractions should be minimized; actual samples of tools, fasteners, and components should be used wherever possible.
- Team teaching, by involving the expertise of several instructors, can reinforce the concept of cross-trade communication through blueprint reading and sketching.

Advanced Level

Course codes assigned to advanced level courses will be TDB1A for Grade 9 and TDB2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skill in using freehand sketching to assist themselves in visualizing three-dimensional objects represented as orthographic projections on a blueprint;
- acquire background knowledge of technological features represented on typical blueprints;
- develop an appreciation of the importance of blueprint-reading skill as a communications link between the concept and the finished product;
- relate acquired knowledge of mathematics and scientific principles to the technology represented on the blueprint;
- develop the skills necessary to write a technical report;
- acquire an overview of the occupations that require blueprint-reading skills.

Suggestions for Teachers

The core content for courses in blueprint reading and sketching at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 5.1.2. Students studying at the advanced level of difficulty can be expected to deal with the

content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is normal in general level courses. This difference in focus should be reflected in the objectives for the course.

Where time permits, optional content may be selected from other subjects within the graphics grouping or from related subjects, such as construction technology or machine shop practice, from other groupings. The optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of these topics as independent study, particularly in bi-level courses, where advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various technological topics should be included in the course.

Blueprint Reading and Sketching

Senior Division

(Grades 11 and 12)

Courses in blueprint reading and sketching can provide students with the basic knowledge and skills they need to comprehend technological ideas and concepts expressed through numbers, symbols, and words in ways that are unique to the industrial world.

In the Senior Division, the emphasis of the program shifts from exploration and integration (cross-trade communication) to preparation for employment or further study. Students who plan to enter an apprenticeship should be made aware of the provincial Linkage programs, particularly in those trades for which specific performance objectives in blueprint reading and sketching apply. Information on these programs is available from the directors of the Ministry of Education's regional offices.

The core content of the Senior Division courses in blueprint reading and sketching focuses on the fundamentals of mechanical-drawing interpretation as it relates to the general machinist's trade. The concepts are transferable to many trades and facilitate cross-trade communication.

The core learning included in these sections is intended to serve two general purposes:

- to complement specific areas of technical specialization that prepare students for direct entry into employment;
- to develop essential skills for interpreting engineering and manufacturing drawings in order to enhance the students' potential for success in apprenticeship programs, industrial training, and postsecondary studies.

Related to these purposes are a number of specific objectives that students in Senior Division may wish to pursue. These include the following:

- acquiring problem-solving skills in blueprint reading in order to pass tests used by many employers when hiring;
- receiving credit for part or all of the blueprint-reading performance objectives in particular Linkage programs by meeting the criteria outlined in the training profiles;
- reinforcing concepts developed in other technological subjects in their package of courses in preparation for more in-depth specialization through apprenticeship or postsecondary studies;
- acquiring knowledge of, and skill in using, the standardized symbols and language of industry in preparation for entry into the computer-aided design and computer-aided manufacturing fields.

Courses in blueprint reading and sketching are authorized for Grades 11 and 12 at basic, general, and advanced levels of difficulty. Chart 5.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 5.1.3
Core Content for
Blueprint Reading
and Sketching
Senior Division
(Grades 11-12)

Content Units	Core Content for Courses	
	Basic	General / Advanced
1. Graphics industry	ab	abc
5. Orthographic projection	abc	abc
6. Sketching techniques	ab	abc
7. Dimensioning	ac	ac
8. Drawing conventions and interpretation	ab	abc

Content Units	Core Content for Courses	
	Basic	General / Advanced
9. Sectional views	ac	ac
10. Auxiliary views	a	ab
11. Types of drawings and standards	abc	abc
12. Pictorial drawings	a	ab
14. Fastening devices	a	a
71. Reading mechanical engineering prints	ab	ab
72. Basic shop mathematics	a	ab
78. Principles of tolerance		a
79. Engineering materials		a
80. Basic manufacturing processes		a

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TDB3B for Grade 11 and TDB4B for Grade 12.

Aims

In this subject, the aims outlined for basic level courses in the Intermediate Division are also relevant to basic level courses in the Senior Division. Students who complete the Senior Division program at the basic level will, in addition, have the opportunity to:

- acquire the basic knowledge and skills needed to comprehend the ideas and concepts conveyed by the words, numbers, and symbols on a typical industrial blueprint;

- develop confidence in their ability to translate the ideas and concepts outlined on a blueprint into an actual project or an oral or written description;
- acquire the skills in blueprint reading and sketching necessary for entrance into industrial/manufacturing employment.

Suggestions for Teachers

As indicated in the Intermediate Division section, the subject of blueprint reading and sketching has a specific core of knowledge and skills that must be mastered before they can be applied in the exploration of various trade areas. The development of this knowledge and skill should be planned around the core content listed under unit 71 ("Reading mechanical engineering prints"). This learning can then be extended to the trade areas identified under such units as 73 ("Structural steel

components"), 76 ("Welding fabrication"), and 77 ("Architectural blueprints"), listed under "Course Content for the Graphics Grouping" at the end of this module.

In basic level courses, blueprint reading and sketching can be effectively applied to other trade areas through short units that meet particular needs. Such needs may relate to other technical subjects that are being studied by

students as part of a school-related package of courses or to content that is particularly relevant to occupational activities in local industry (community related).

In Senior Division courses at the basic level, skill development of an operational nature should be emphasized through a variety of practical activities. As retention of learning in these skill areas from Intermediate Division courses can be expected to vary among students, the core learning for Intermediate Division courses in this subject is included as part of the Senior Division program. For some students this basic core of learning simply requires reinforcement before new applications are undertaken; for others, more time must be spent in achieving the required level of skill and knowledge before new applications in other trade areas can be undertaken.

Every opportunity to relate blueprint-reading and -sketching assignments to concrete examples, models, or actual working parts and components should be used. The suggestions outlined for basic level courses in the Intermediate Division for this subject apply as well to Senior Division courses at the basic level of difficulty.

The involvement of industrial representatives from the community in the planning of courses and school-related or community-related packages is highly desirable. Courses in blueprint reading and sketching developed in this way can have a more immediate application to employment – a prime concern of any basic level program. As well, the activities in all basic level courses should be planned to contribute to the students' personal skills, social understanding, and self-confidence – desirable characteristics for responsible citizenship.

General Level

Course codes assigned to general level courses planned under this section will be TDB3G for Grade 11 and TDB4G for Grade 12.

Aims

The core aims for general level courses in the Intermediate Division are relevant to general level courses in the Senior Division, too. Students who complete the Senior Division program of general level blueprint reading and sketching will, in addition, have the opportunity to:

- acquire the fundamental knowledge and skills required to comprehend ideas and concepts communicated through words, numbers, and symbols on a typical industrial blueprint;

- develop confidence in their ability to translate the ideas and concepts outlined on a blueprint into an actual project or an oral or written description;
- acquire skills and knowledge in blueprint reading and sketching that will meet the entrance requirements of local manufacturing/industrial employers;
- meet the performance criteria specified for the blueprint-reading objectives listed in the training profiles for particular Linkage programs;
- develop blueprint-reading skills for personal use.

Suggestions for Teachers

The core learning in blueprint reading and sketching specified for courses in the Intermediate Division is included in the core content specified for courses in the Senior Division. The core learning that focuses on mechanical applications (unit 71) should be satisfactorily achieved before students extend the learning to applications in other technical cases.

Any of the optional units listed under "Course Content for the Graphics Grouping", such as 73 ("Structural steel components"), 74 ("Power transmission"), 75 ("Electrical/electronic blueprints"), 76 ("Welding fabrication"), or 77 ("Architectural blueprints"), can serve as a direction in which students may

extend their skill and knowledge. Blueprint-reading applications associated with other subjects in technological studies, such as power transmission and control or instrumentation, may also be included where appropriate.

Teachers in specialized disciplines such as electronics, construction technology, general machinist, welding, or power transmission, associated with blueprint reading and sketching in their courses where appropriate. This cross-disciplinary approach should be encouraged and reinforced in blueprint-reading and -sketching course work wherever possible.

The choice of optional topics in the blueprint-reading and -sketching course should match student goals wherever possible. If a student is specializing in construction technology, for example, then unit 77, "Architectural (construction trades) blueprints", can be emphasized.

In planning courses in blueprint reading and sketching for the Senior Division, input should be sought from representatives of local industry and colleges of applied arts and technology. In many cases, these courses can be planned as a component course in a school-related package that focuses on a Linkage program area such as millwright or general machinist. In such cases, achievement of terminal performance objectives related to blueprint reading and listed in the training profile for the particular Linkage program can be one goal of the related course. Regular communication among the teachers involved in such packages can lead to maximum utilization of available resources and in general provides an effective approach for improving the quality of programs.

Strategies for general level courses in blueprint reading and sketching, outlined in the Intermediate Division section under "Suggestions for Teachers", can also be readily adapted to Senior Division courses.

Advanced Level

Course codes assigned to advanced level courses will be TDB3A for Grade 11 and TDB4A for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop further skill in freehand sketching as a means for assisting in the visualization and communication of particular aspects of complex three-dimensional objects represented as orthographic projections on a blueprint;
- acquire knowledge of technological processes, components, materials, and other features represented on a variety of blueprints;
- develop the ability to plan the steps necessary to visualize and interpret drawings for estimating purposes;
- relate acquired knowledge of mathematics and scientific principles to the technology represented on the blueprint;
- acquire and further improve skills in researching and communicating technological ideas and information through written reports and oral presentations;
- acquire knowledge of the functions of drawings at the design, production, and marketing stages of a product.

Suggestions for Teachers

The core content for courses in blueprint reading and sketching at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 5.1.3. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is normal in general level courses. This difference in focus should be reflected in the objectives set by the teacher for the course.

Where time permits, optional content may be selected from other subjects within the graphics grouping or from related subjects, such as construction technology or machine shop practice, from other groupings. The optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of these topics as independent study, particularly in bi-level courses, where advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various technological topics should be included in the course.

Students who are bound for postsecondary studies and wish to take this course at the advanced level need to be appropriately challenged by their assignments. Units such as 74 ("Power transmission") and 79 ("Engineering materials") can be expanded to provide such a challenge. In all cases, students should perceive blueprint-reading and -sketching courses as having relevance to their educational and career goals.

Graphic Communications

Intermediate Division

(Grades 9 and 10)

The graphic communications industry has undergone a revolution in technology and methodology in the last decade. These changes are reflected in the industry's new title of graphic communications, a comprehensive title that has superseded the designations "printing" and "graphic arts".

The changes in the industry have brought a new emphasis in graphic communications education: expansion of the traditional teaching of the trade to include the whole of the industry and the role it plays.

The following sections recognize the transition taking place within the various industries that make up the graphic communications industry. The student programs based on these sections will therefore reflect a blend of traditional and new industrial practices.

Graduates are increasingly in demand as the industry takes on a new professional role in communications. Many traditional career classifications have lapsed. Many more new career opportunities have developed.

Graphic communications facilities vary considerably in size and equipment. The following sections for courses in Grades 9 and 10 cover

a broad range of the communications industry. Teachers should choose from these sections according to the facilities and equipment available and the program required. The breadth and depth of coverage of each unit will vary according to the credit time being offered.

Courses in graphic communications are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 5.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 440 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety; graphic art and design; proofreading and copy editing; paste-up, mechanical construction, and hand ruling; and darkroom fundamentals.

Chart 5.1.4
Core Content for
Graphic
Communications
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General / Advanced
21. History of printing	a	ab
22. Overview of graphic communications industry	a	b
23. Principles of printing	a	ab
24. Introduction to advertising		a
25. Safety and health	a	ab
26. Graphic art and design		a
27. Introductory principles and practices of typography	a	ab
28. Creating layouts	a	ab
29. Typesetting practices	a	ab
30. Proofreading and copy editing	a	ab

Content Units	Core Content for Courses	
	Basic	General / Advanced
31. Paste-up, mechanical construction, and hand ruling	a	b
32. Process camera	a	ab
33. Darkroom fundamentals	a	ab
34. Diffusion transfer processing		a
35. Screen tints and special-effect screens		a
36. Contact printing	a	ab
37. Stripping procedures	a	ab
38. Proofing methods and systems		a
39. Offset platemaking procedures	a	ab
40. Lithographic offset press printing	a	ab
41. Bindery procedures	a	a

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TGR1B for Grade 9 and TGR2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- gain an appreciation of the role the graphic communications industry plays in the personal life of each individual;
- develop an awareness of the need for literacy in the technical vocabulary of graphic communications technology;
- improve efficiency in the use of the English language through practice with the printing medium;
- develop awareness of, and skills in the use of, particular materials, techniques, equipment, and tools relevant to the industry;
- develop an appreciation of the need for accuracy and completeness in work performance;
- develop productive and efficient work habits and learn to appreciate good organization in the workplace;
- develop hand/eye co-ordination;
- develop an appreciation for, and the practice of, good safety habits;
- produce printing projects involving basic prepress, printing press, and bindery technologies.

Suggestions for Teachers

Courses based on this section should introduce students to the nature of printing and provide them with an awareness of the broad scope of the graphic communications industry and the extensive role it plays in the life of every individual.

In planning of courses based on this section, the order in which the course content and the various objectives are presented to students is at the discretion of the teacher. Courses should be planned to systematically reinforce the knowledge and skills students acquire and to recognize the considerable range of abilities among students taking basic level courses. The depth of treatment of the topics embraced in the core learning depends on both the time allocated to the course and the ability level of the students.

Graphic communications courses should, if possible, be integrated with the students' academic programs. Students should be encouraged to improve their language skills by being given assignments that will provide them with the opportunity to do some creative writing. They should also be given projects that involve artistic development.

A good working knowledge of the English language is essential to the successful practice of proofreading. In basic level courses, practice in proofreading should be structured at the ability level of the students and should encourage them to reach for increased proficiency.

Intermediate Division courses should include sufficient instruction in the basic components to permit the creation of meaningful projects that require extensive hands-on experience. Such projects should emphasize skill development.

The learning-by-doing concept is an integral part of a program in technical education and should be reflected in projects of practical value. These projects should afford students

the opportunity to gain an understanding of the importance of graphic communications' role in everyday life and should provide them with the chance to exercise judgement and make decisions related to creative and technical processes.

The cultivation of good work habits and safety practices is of paramount importance. The development and encouragement of productive work habits, safety awareness, and co-operative working relationships should be integrated throughout the curriculum on an ongoing basis. Good work habits and safety are particularly important in the operation of equipment, use of chemicals, and flow of traffic in the classroom.

Students studying graphic communications at the basic level of difficulty should be evaluated primarily on the work they perform day to day. The teacher should develop, through observation and discussion with students, a profile of each student's progress. Evaluation should not be a threatening experience for students. If the teacher rates students' work frequently, students can keep track of how they are doing and can work to improve their ratings. Projects that are well done should be put on display for other students to see. From 70 to 80 per cent of the student's final mark should be based on the practical work, with scores on short written tests making up the other 20 per cent.

The incorporation of work experience or co-operative education components into the course and the participation of industry through in-school and in-plant visits are encouraged because they provide students with insights into careers and further training opportunities.

General Level

Course codes assigned to general level courses planned under this section will be TGR1G for Grade 9 and TGR2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire an appreciation of the graphic communications industry as a family of industries;
- acquire knowledge of the history of printing and an understanding of its historical significance;
- investigate and develop awareness of the history of printing in Canada;
- acquire technical knowledge and skills in the use of print media;
- become aware of the wide variety of printing methods;
- acquire basic knowledge about and skills in photo-offset lithography, thereby gaining some insight into the content of apprenticeship training;
- improve communication skills related to the trade;
- acquire an appreciation of the need for mathematics, chemistry, and physics in photo-offset lithography;
- acquire knowledge of career and training opportunities in the graphic communications industry;
- acquire knowledge of the principles and practices of graphic design and typography;
- develop an understanding of the role and importance of graphic design and typography in communication efforts;
- develop an understanding of the need for performance standards and pride in one's work;
- develop a positive attitude towards proper safety habits and procedures.

Suggestions for Teachers

Courses based on this section should be planned to provide an overview of the total graphic communications industry. This approach should assist students in identifying potential career opportunities and becoming aware of the various options for further training and education in this technological field after graduation. Students should acquire insights into the general aspects of graphic design and typography in preparation for more advanced work in the Senior Division.

When dealing with unit 21 ("History of printing"), the teacher should discuss the roles played by the prominent personalities involved in the development of the graphics industry. It is important to provide learning materials involving the historical development of the graphics industry.

The order in which the topics of core learning are presented to students is at the teacher's discretion. Projects and other practical work should form a major part of the students' activities in the shop. The knowledge, infor-

mation, and skills that students acquire in the course should be recorded by students in a systematic fashion, and a portfolio of their projects and work achievements should be maintained.

A good working knowledge of the English language is essential to the successful practice of proofreading. Such knowledge includes a command of spelling (Canadian and American), punctuation, abbreviations, capitalization, word division, hyphenation, syllabication, homonyms, and the general do's and don'ts of language usage that are currently in vogue.

Teachers should endeavour to keep up to date and be open to the many ways computers can be used for production, project scheduling, program management, curriculum construction, instruction, and lesson planning.

In most communities there are prominent figures in the printing industry – individuals accredited in their specialty. Teachers

are encouraged to extend invitations to such resource people to visit and meet with the students and, where appropriate, to deliver presentations related to their area of expertise.

The graphic communications industry strongly supports graphic communications education with organizations for students and teachers, abundant literature and audio-visual material, and professional development opportunities. The learning materials can augment classroom demonstrations, illustrate equipment, and support the learning process in general. Audio-visual materials can be particularly useful for introducing printing methods other than

photo-offset technology. In addition, the audio-visual materials can foster and accommodate independent study and the individual learning styles of students.

Evaluation of both theoretical understanding and practical performance should be frequent. Short tests on a limited number of topics are often the best way to measure what a student has learned. Approximately 70 per cent of the student's final mark should be based on the practical component of the course. Students should be made aware at the beginning of the course of how they are going to be evaluated.

Advanced Level

Course codes assigned to advanced level courses will be TGR1A for Grade 9 and TGR2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe personal work habits and a positive attitude towards maintaining a safe environment for others in the workplace;
- develop knowledge and skill in the use of equipment commonly used in the graphic communications industry;
- acquire knowledge and understanding of the functional role of the various methods of printing and their contribution to the industry;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- relate acquired knowledge of mathematics and the study of English to applications in the graphic communications industry;
- acquire and further improve skills in researching and communicating technological ideas and information through written reports and oral presentations;
- acquire an overview of the occupational opportunities available in the graphic communications industry and an understanding of educational and training alternatives for these occupations.

Suggestions for Teachers

The core content for courses in graphic communications at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 5.1.4. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent

than is normal in general level courses. This difference in focus should be reflected in the objectives for the course set by the teacher.

Where time permits, optional content may be selected from other subjects within the graphics grouping or from other groupings. The optional content in each case should be selected to fit learning objectives planned

for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of these topics as independent study, particularly in bi-level courses, where advanced level may be differentiated from general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various graphic communications topics should be included in the course.

Students studying at the advanced level should be evaluated in three major areas: practical work, theory, and research. The final mark should be weighted roughly 50 per cent for the practical work, 30 per cent for the theoretical component, and 20 per cent for the research project.

Graphic Communications

Senior Division

(Grades 11 and 12)

Courses in graphic communications may be offered in the Senior Division, at basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the guideline *Graphic Arts, Senior Division, 1972*.

When planning courses for the Senior Division, teachers may include additional topics from the units listed under "Course Content for the Graphics Grouping" (starting on page 40) or from any of the other subject groupings in Part B of the technological studies guideline.

Photography

Intermediate Division

(Grades 9 and 10)

Courses based on this section encompass three main areas of study: photographic composition, proper use of equipment, and photographic processes. Students will be introduced through these courses to a broad range of photographic techniques, processes, and knowledge, which will provide them with a perspective on the industry. The skills, knowledge, and aesthetic sensitivity that students can acquire through photography courses are supportive of career goals as well as avocational goals and can provide students with a medium for individual creative expression throughout their lives. While basic level courses are oriented more towards promoting photography as an additional skill in the world of work or

for personal use, general level courses will be directed more towards careers or postsecondary education.

Courses in photography are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 5.1.5 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow.

Courses in photography in the Intermediate Division may vary in time allotment and may be designed to offer credit for up to 220 hours of in-school work each year.

Chart 5.1.5
Core Content for
Photography
Intermediate Division
(Grades 9-10)

Content Units	Core Content for Courses	
	Basic	General / Advanced
25. Safety and health	a	a
42. The basic camera	a	
43. Major types of cameras		a
44. Exposure controls on the camera	ab	abc
45. The lens	a	bc
46. Film	ab	abc
47. Processing b/w film	a	a
48. Printmaking	a	ab
49. Understanding light	a	ab
51. Composition	ab	ab
52. Print finishing	a	ab
60. Pinhole camera	a	
61. History of photography		a
62. Contrast in photography		a

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TGP1B for Grade 9 and TGP2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- gain an overview of the nature and extent of the industry and its development;
- develop an attitude of respect, sharing, and especially co-operation with fellow workers;
- learn and practise safe and clean working habits and procedures in a photographic laboratory;
- acquire knowledge and skills in the use of cameras and films;
- acquire knowledge and skills in the processing of film and production of enlargements;
- learn and apply simple rules of composition through photographic assignments;
- acquire a knowledge and understanding of the workings and functions of various parts of a camera;
- learn and use proper photographic terminology;
- acquire a knowledge of and use different types of lighting;
- explore job opportunities and union and apprenticeship requirements.

Suggestions for Teachers

It is important to bear in mind that in basic level courses in the Intermediate Division, the emphasis should be on developing good individual work habits and nurturing the students' ability to complete practical work tasks independently.

General safety procedures in the photographic laboratory or studio, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course. Safety rules relating to specific equipment, chemicals, and other materials and environmental situations should be introduced before students undertake particular activities and should be continually emphasized.

Cleanliness, prevention of chemical contamination, and good darkroom habits should be discussed and encouraged throughout the course.

Assignments planned for the basic level should have clear and simple objectives for purposes of promoting success and achievement. To help students succeed, the teacher should discuss the marking scheme for the photo projects at the time of giving the assignments. It is important to clearly establish with students how they are to be evaluated and how marks will be compiled.

It should be demonstrated to the students working at the basic level how a working knowledge of photography can provide them with a lifelong hobby or ability that will allow

them to pursue individual artistic expression or to participate in almost any other interest or activity with greater depth and versatility.

There is unlimited access to all kinds of printed literature full of photographs that can be cut out to illustrate techniques or themes or used in assignments. Such materials can provide a very inexpensive means of experimenting with composition, mounting, arrangement, and so forth.

Courses planned for the basic level of difficulty can emphasize particular aspects of the core content, depending on employment opportunities. Courses that place emphasis on processing techniques and print finishing, for example, will assist students who plan to seek employment in small photography shops.

Units 33, 65, and 66 listed under "Course Content for the Graphics Grouping" (starting on page 40) can be considered in addition to the core content and may or may not be used, depending on time allocations, availability of materials, and objectives. They can easily be made into work projects that help the student to understand and control contrast, tone, and the negative-to-positive principle.

Projects for basic level students can easily be adapted to incorporate other subject areas of study. As photography is a tool of visual communication, students can be asked to illustrate concepts in other studies – transportation, vegetation, erosion, food groups, age groups of people, business, or whatever – and to include the results in their notes.

Clean work habits and a clean workshop are essential to good results in processing and printmaking. All procedures required to maintain cleanliness should be demonstrated to the students and their mastery included in the marking scheme of the practical part of the course.

Teaching and testing at the basic level can be assisted by simple diagrams and drawings. When testing students on a photographer's use of certain techniques in a particular photograph, it is wise to select a photographic subject that students can relate to, such as cars in a race, basketball players in action on the court, or rock stars on a concert stage.

General Level

Course codes assigned to general level courses planned under this section will be TGP1G for Grade 9 and TGP2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- cultivate a respect for photography today through an understanding of its historic background and origins;
- co-operate with peers in photographic projects and assignments;
- learn and practise proper procedures in the use of darkroom chemicals and equipment;
- understand and use the various parts of a camera;
- learn and use appropriate photographic terminology;
- acquire knowledge and skills in the selection, care, and use of the various types of cameras and films;
- demonstrate their skills and knowledge in the processing and printing of films and making of enlargements;
- identify and use the basic rules of composition to help develop an aesthetic sensitivity;
- acquire knowledge and skill in proper presentation technique;
- acquire knowledge and skill in the use of various types of lighting;
- acquire knowledge of careers and further training opportunities in the photographic arts field.

Suggestions for Teachers

Safety rules related to specific equipment, chemicals, other materials, and environmental situations should be introduced before students undertake particular activities and should be continually emphasized. General safety procedures in the photographic laboratory or studio, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed.

Cleanliness, prevention of chemical contamination, and good darkroom habits should be discussed and encouraged throughout the course.

The marking scheme for practical assignments should be objective and carefully discussed with the students before assignments are handed out.

Courses planned for the general level of difficulty should emphasize that there are two approaches to future employment. The first approach involves seeking employment, after graduation, in a small photography or photo-finishing shop. The second approach involves undertaking postsecondary education in a college of applied arts and technology or other non-university institution. Graduates of post-secondary programs are qualified for photography and photo-finishing occupations in studios and laboratories, in communications firms, and in commercial, medical, scientific, and industrial enterprises. Alternatively, post-secondary graduates can start their own photography businesses. Students should also understand that photography has broad applications and is a valuable asset to the employee

in other areas of employment in many businesses and industries.

As much as possible, photography assignments should directly reinforce the core content.

In order to encourage a more rounded view of photography within the visual arts, units 48, 60, and 67 listed under “Course Content for the Graphics Grouping” (starting on page 40) are offered as suggestions for additional assignments and hands-on learning. They are

not intended as core content but may be considered for inclusion in the course as long as time, materials, and equipment are available and the core content has been satisfactorily covered.

Although composition is not specifically included in the course material at this level, students should be encouraged to see the value of some compositional guidelines. Teachers can easily offer some guidelines by critiquing the students’ photo assignments but not subtracting marks from the assignments.

Advanced Level

Course codes assigned to advanced level courses will be TGP1A for Grade 9 and TGP2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe personal work habits and a positive attitude towards maintaining a safe environment for others in the workplace;
- develop knowledge and skill in the use of cameras and equipment commonly used in the photography industry;
- acquire knowledge and understanding of various ways in which photography is used in our society as a form of communication;

- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- relate acquired knowledge of science, mathematics, and other academic subjects to photography;
- investigate a topic related to graphic communication and write a technical report;
- acquire an overview of the occupational opportunities available in the photography industry and an understanding of educational and training alternatives for these occupations.

Suggestions for Teachers

The core content for courses in photography at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 5.1.5. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is normal in general level courses. This difference in focus should be reflected in the objectives for the course set by the teacher.

Where time permits, optional content may be selected from other subjects within the graphics grouping or from other groupings. The

optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of the optional topics as independent study, particularly in bi-level courses, where the advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various graphic communications topics should be included in the course.

Photography

Senior Division

(Grades 11 and 12)

The knowledge, skills, and aesthetic sensitivity that students can acquire through photography courses are supportive of career as well as avocational goals. Students taking photography courses should be made aware of the various career opportunities that can challenge their artistic, technical, experimental, or business talents. Students interested in postsecondary study should also be aware of the programs in both photographic and visual arts offered by the colleges. Enrolment in these can further increase opportunities for successful employment and advancement.

Courses in photography are authorized for Grades 11 and 12 at basic, general, and advanced levels of difficulty. Chart 5.1.6 identifies the core content for these levels. The core aims and suggestions for designing courses at these levels are provided in the sections that follow.

Courses in photography in the Senior Division may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 5.1.6
Core Content for
Photography
Senior Division
(Grades 11-12)

Content Units	Core Content for Courses	
	Basic	General / Advanced
25. Safety and health	a	a
43. Major types of cameras	a	
44. Exposure controls on the camera	bde	bdef
45. The lens	ce	cef
46. Film	bcd	bcd
48. Printmaking	c	
49. Understanding light	c	cd
50. Use of the light meter	a	a
51. Composition	ac	ac
61. History of photography	a	
63. Filters	a	a
64. Basic colour theory	a	ab
67. Pushing film	a	a

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TGP3B for Grade 11 and TGP4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop attitudes that foster respect for and co-operation with fellow workers;
- learn and practise safe and clean working habits and procedures in a photographic laboratory;
- cultivate a respect for photography today through exposure to its historic background;

-
- acquire knowledge and skill in proper presentation techniques;
 - learn and use proper photographic terminology;
 - acquire knowledge and understanding of the visual effects of focal length;
 - learn and practise the use of various types of cameras;
 - acquire knowledge and skills in processing films, contact printing, enlarging, and toning;
 - recognize, understand, and use various qualities of light and lighting methods when taking pictures;
 - develop aesthetic sensitivity and use rules of composition and photographic techniques to express it;
 - acquire knowledge of careers, career-related opportunities, and further training opportunities in photography.
-

Suggestions for Teachers

General safety procedures in the photographic laboratory or studio, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed throughout the course. Safety rules related to specific equipment, chemicals, and environmental situations should be introduced before students undertake particular activities that involve them.

Courses planned for the basic level of difficulty can emphasize particular aspects of the core content, depending on employment opportunities. Courses that place emphasis on processing techniques, print finishing, and cameras, for example, will assist students who plan to seek employment in small photography and photo-finishing shops.

Students should be made aware of the wide range of applications for photography in the fields of business and industry. Photography skills can be a valuable asset in the search for employment. The student should therefore have a well-rounded photographic knowledge, especially in the area of camera use and films.

At the basic level of difficulty in the Senior Division, special emphasis should be placed on learning through practical assignments, in order to foster students' confidence in their use of photographic equipment and materials.

Units 57, 67, 68, 69, and 70 listed under "Course Content for the Graphics Grouping" (pages 40 to 50) are suggested as optional, hands-on content. These should be perceived

not as required topics but as opportunities for attaining a wider scope of photographic and visual arts knowledge when the core content has been covered satisfactorily and time, equipment, and materials are available.

Proper darkroom procedures (including clean working habits) should be demonstrated in the students' laboratory activities, and mastery of them should be recognized in the marking system.

At this level, the core content learning should be directly reinforced by the photography assignments. Practical, hands-on assignments not only reinforce theory but also accurately measure student understanding of it. More weight should be placed on the practical aspect of the course than on the theoretical.

Teachers should select from magazines examples of photography that illustrate a variety of camera and darkroom techniques. Students can be assigned the task of duplicating a particular effect. These student photographs can then be compared with the original.

A field trip will provide a great deal of motivation for students and give them a practical experience that is possible only at a location away from the school. For example, students can be assigned the task of illustrating shape, form, pattern, and texture within an unused local gravel pit. It is important that the teacher be aware of the safety issues involved in such a trip and prepare the students accordingly.

General Level

Course codes assigned to basic level courses planned under this section will be TGP3G for Grade 11 and TGP4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- undertake assignments that necessitate helping, sharing, and co-operation;
- develop skills in presentation techniques;
- practise proper procedure in the use and care of darkroom tools, chemicals, and processes;
- acquire knowledge and skills in the selection, use, and care of various types of cameras and films;
- understand and be able to use various films, processes, and printing techniques to achieve a variety of results;
- recognize and use various methods of lighting to achieve specific results in contrast, detail, and mood;

- acquire a basic knowledge of colour theory and colour temperature;
- cultivate an aesthetic sensitivity and express it through composition, proper camera use, and printing controls;
- respond in kind to the instructor's proper use of photographic terminology and proper language skills;
- acquire knowledge and skill in the use of lenses of various focal lengths;
- be advised of careers, career-related opportunities, and postsecondary education in photography and/or the arts at colleges and universities.

Suggestions for Teachers

Safety rules for the use of specific equipment and chemicals in particular environmental situations should be introduced before students undertake these activities. General safety procedures in the photographic laboratory or studio, and the responsibility of every student in this regard, should be discussed at the beginning of the course and closely followed.

Cleanliness, prevention of chemical contamination, and good darkroom habits should be discussed at the appropriate times and encouraged throughout the course.

Courses planned for the general level of difficulty should emphasize that there are two approaches to future employment. The first approach involves seeking employment, after graduation, in a small photography or photo-finishing shop. The second approach involves undertaking postsecondary education in a college of applied arts and technology or other non-university institution. Graduates of postsecondary programs are qualified for photography and photo-finishing occupations in studios and laboratories, in communications firms, and in commercial, medical, scientific,

and industrial enterprises. Alternatively, postsecondary graduates can start their own photography businesses. Students should also understand that photography has broad applications and is a valuable asset to the employee in other areas of employment in many businesses and industries.

As much as possible, photography assignments should directly reinforce the core content. The marking scheme for each practical assignment should be objective and should be carefully discussed with the students before the assignment is handed out.

The use of units 33(c), 57, 68, and 70 listed under "Course Content for the Graphics Grouping" (pages 40 to 50) is suggested to encourage a more rounded view of photography within the visual arts. These topics provide further opportunities for hands-on learning.

General level students should be able to acquire an overview of photographic materials. They should gain insights into the limitations of the use of silver in imagery. Students can compare the silver process with processes

involving newly discovered photosensitive materials and can make predictions about the uses of both.

There are always many competitions for students in this age group, sponsored by newspapers and other publications and by local institutions (libraries and galleries), as well as regional, provincial, and interschool competitions. Students should be helped and encouraged to enter such competitions to build

self-confidence and a competitive nature. Winning these competitions bolsters motivation and morale for both student and school.

Work experience programs of one or two weeks' duration are ideal for general level students. These can be arranged with small local businesses such as portrait studios, newspapers, and photo-finishing labs.

Advanced Level

Course codes assigned to advanced level courses will be TGP3A for Grade 11 and TGP4A for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards safe work habits and an awareness of hazardous situations both in the shop and in the field;
- develop knowledge and skill in the application of some advanced photographic techniques;
- study how photography is used as a marketing tool;
- review the historical development of photography and project possibilities for future development;
- develop the creative ability to design photographic settings for people and objects that communicate a desired effect;
- relate principles in physics and chemistry to the study of photography;
- acquire and further improve skills in researching and communicating technological ideas and information through written reports and oral presentations;
- acquire an overview of the occupational opportunities available in the photography industry and an understanding of educational and training alternatives for these occupations.

Suggestions for Teachers

The core content for courses in photography at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 5.1.6. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is normal in general level courses. This difference in focus should be reflected in the objectives set by the teacher for the course.

Where time permits, optional content may be selected from other subjects within the graphics grouping or from other groupings. Additional content could include topics from units such as 45, 48, 50, 51, 52, 56, 61, 62, and 63 listed in "Course Content for the Graphics

Grouping", beginning on page 40. The optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of the optional topics as independent study, particularly in bi-level courses, where the advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various graphic communications topics should be included in the course.

Vocational Art

Intermediate and Senior Divisions (Grades 10, 11, and 12)

Courses in vocational art may be offered in technological studies in Grades 10 to 12 at basic, general, and advanced levels of difficulty. Planning for these courses will be based on the curriculum guideline *Visual Arts, Intermediate and Senior Divisions*, subject to the following provisions:

- Vocational art courses will be based on the content components outlined in the above guideline for the *special-series courses* (Grades 10–12) and will be planned to support themes of an occupational or vocational nature.
- The teacher of vocational art courses must hold technological qualifications in vocational art appropriate to the grade and level of difficulty for which the course is offered.

When courses are planned for vocational art, additional topics may be included from the units listed under “Course Content for the Graphics Grouping” (at the end of this module) or from any of the subject groupings in Part B of the technological studies guideline.

Vocational art courses that meet the indicated provisions will have the initial three letters TGV as the stem of the course code. Courses so identified may be counted by students for technological studies credit towards endorsement and/or the technological/business studies requirement for the diploma.

Summary of Core Content for Courses in the Graphics Grouping

Chart 5.1.7

Content Units	Drafting (Grades 9-10)			Blueprint Reading and Sketching (Grades 9-10) (Grades 11-12)				Graphic Communications (Grades 9-10)		Photography (Grades 9-10) (Grades 11-12)			
	Basic	Gen	Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv
1. Graphics industry	a	ab	abc	a	ab	ab	abc						
2. Introduction to drafting	a	ab	abc										
3. Basic drafting skills and equipment	a	ab	abc										
4. Geometric construction	a	ab	abc										
5. Orthographic projection	a	ab	abc	a	abc	abc	abc						
6. Sketching techniques	a	ab	abc	a	ab	ab	abc						
7. Dimensioning	a	ab	abc	ac	ac	ac	ac						
8. Drawing conventions and interpretation	a	ab	abc	a	ab	ab	abc						
9. Sectional views	a	ab	abc	ab	abc	ac	ac						
10. Auxiliary views		a	ab			a	ab						
11. Types of drawings and standards	a	ab	abc			abc	abc						
12. Pictorial drawings	a	ab	abc	a	ab	a	ab						
13. Systems drawings	a	b	ab	a	ab								
14. Fastening devices						a	a						
15. Development drawings													
16. Paste-up drafting													
17. Technical illustration													
18. Topographic drafting													
19. Perspective drawing													
20. Graphs and charts													
21. History of printing								a	ab				
22. Overview of graphic communications industry								a	b				
23. Principles of printing								a	ab				
24. Introduction to advertising									a				
25. Safety and health								a	ab	a	a	a	a
26. Graphic art and design									a				
27. Introductory principles and practices of typography								a	ab				
28. Creating layouts								a	ab				
29. Typesetting practices								a	ab				
30. Proofreading and copy editing								a	ab				

Content Units	Drafting (Grades 9-10)			Blueprint Reading and Sketching (Grades 9-10) (Grades 11-12)				Graphic Communications (Grades 9-10)		Photography (Grades 9-10) (Grades 11-12)			
	Basic	Gen	Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv
31. Paste-up, mechanical construction, and hand ruling								a	b				
32. Process camera								a	ab				
33. Darkroom fundamentals								a	ab				
34. Diffusion transfer processing									a				
35. Screen tints and special-effect screens									a				
36. Contact printing								a	ab				
37. Stripping procedures								a	ab				
38. Proofing methods and systems									a				
39. Offset platemaking procedures								a	ab				
40. Lithographic offset press printing								a	ab				
41. Bindery procedures								a	a				
42. The basic camera										a			
43. Major types of cameras											a	a	
44. Exposure controls on the camera										ab	abc	bde	bdef
45. The lens										a	bc	ce	cef
46. Film										ab	abc	bcd	bcd
47. Processing b/w film										a	a		
48. Printmaking										a	ab	c	
49. Understanding light										a	ab	c	cd
50. Use of the light meter												a	a
51. Composition										ab	ab	ac	ac
52. Print finishing										a	ab		
53. Design concepts													
54. Colour processing													
55. Portraiture													
56. Movie cameras													
57. Television production													
58. Creative photography													
59. Silkscreen printing													
60. Pinhole camera										a			
61. History of photography											a	a	
62. Contrast in photography											a		

Content Units	Drafting (Grades 9-10)			Blueprint Reading and Sketching				Graphic Communications (Grades 9-10)		Photography (Grades 9-10) (Grades 11-12)			
				(Grades 9-10)		(Grades 11-12)				(Grades 9-10)		(Grades 11-12)	
	Basic	Gen	Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv	Basic	Gen/Adv
63. Filters												a	a
64. Basic colour theory												a	ab
65. Photograms													
66. High-/low-key prints													
67. Pushing film												a	a
68. Camera use and double-exposure methods													
69. Use of graphic arts film													
70. Vintage processes													
71. Reading mechanical engineering prints				a	a	ab	ab						
72. Basic shop mathematics						a	ab						
73. Structural steel components													
74. Power transmission													
75. Electrical/electronic blueprints (schematics)													
76. Welding fabrication													
77. Architectural (construction trades) blueprints													
78. Principles of tolerance							a						
79. Engineering materials							a						
80. Basic manufacturing processes							a						

See "Course Content for the Graphics Grouping", beginning on page 40, for description of the subunits a, b, c, etc.

Course Content for the Graphics Grouping

1. Graphics industry	<ul style="list-style-type: none">a) A general overview of the drafting field; career opportunities;b) a brief outline of the various types of drafting and the industries that are associated with them; postsecondary education;c) the historical development of technical drawing and a brief overview of future trends.
2. Introduction to drafting	<ul style="list-style-type: none">a) The basic reasons why drafting exists in the field of technology;b) a brief description of the various forms of graphic representation;c) the relationship between drafting and design.
3. Basic drafting skills and equipment	<ul style="list-style-type: none">a) Names and uses of the basic pieces of drafting equipment; how they should be cared for; linework; lettering; producing a scale drawing;b) reproducing drawings;c) an introduction to the basic principles of design.
4. Geometric construction	<ul style="list-style-type: none">a) Construction of shapes – circles, hexagons, tangent lines;b) ellipse, divisions of a circle;c) dividing a straight line into a given number of parts.
5. Orthographic projection	<ul style="list-style-type: none">a) Concepts of two-dimensional views; basic principles of third-angle projection; selecting and locating views;b) concept of shape description;c) emphasis on visualization.
6. Sketching techniques	<ul style="list-style-type: none">a) Freehand sketching using orthographic projection;b) using oblique and isometric projection;c) more complex shapes with a greater degree of detail.
7. Dimensioning	<ul style="list-style-type: none">a) SI metric – standards; unidirectional and aligned dimensions; rules for placement of dimensions and notes;b) applications for imperial measurement;c) basic principles of tolerance dimensioning.
8. Drawing conventions and interpretation	<ul style="list-style-type: none">a) Drawing standards; common features; blueprint reading;b) variety of symbols;c) CSA and ISO standards.

9. Sectional views	<ul style="list-style-type: none"> a) Reason for drawing a sectional view; purpose, and rules governing location of, cutting plane line and section lines; introduction of the full section; conventions; b) introduction of the half section; c) sectional view of a simple assembly drawing.
10. Auxiliary views	<ul style="list-style-type: none"> a) Reason for drawing an auxiliary view; introduction of primary view only; partial views; b) principles of drawing a secondary view.
11. Types of drawings and standards	<ul style="list-style-type: none"> a) Simple detail and assembly drawing involving three or four parts; parts list; b) introduction to a simple wiring diagram; c) producing a more complex assembly drawing.
12. Pictorial drawings	<ul style="list-style-type: none"> a) Introduction of isometric projection; b) introduction of oblique projection (cavalier only); c) introduction of a cabinet oblique drawing.
13. Systems drawings	<ul style="list-style-type: none"> a) Simple plumbing diagram showing a variety of fittings; b) schematic wiring diagram of a simple logic circuit.
14. Fastening devices	<ul style="list-style-type: none"> a) Permanent fasteners; removable fasteners; representation, interpretation, and specification.
15. Development drawings	<ul style="list-style-type: none"> a) Layout of objects to be fabricated from sheet metal (e.g., cylinders, cones, boxes, transition pieces); drawings of intersections.
16. Paste-up drafting	<ul style="list-style-type: none"> a) Preparation; layout; reproduction techniques.
17. Technical illustration	<ul style="list-style-type: none"> a) Pictorial and rendering techniques.
18. Topographic drafting	<ul style="list-style-type: none"> a) Spot elevations; symbols; contours.
19. Perspective drawing	<ul style="list-style-type: none"> a) Parallel; angular.
20. Graphs and charts	<ul style="list-style-type: none"> a) Types; proportions; statistics interpretation.
21. History of printing	<ul style="list-style-type: none"> a) The development of printing through the ages and its importance to sustaining and advancing civilization; b) the significant stages in the evolution of printing and the individuals involved at each stage.

22. Overview of graphic communications industry	<ul style="list-style-type: none"> a) The role the industry plays in people's lives; b) the industry as one of the world's largest industries, as a family of industries, as a custom manufacturing industry; a review of industry components, including design, production, and support industries.
23. Principles of printing	<ul style="list-style-type: none"> a) Characteristics of the major processes of printing and demonstration of these methods if the equipment is available; raised surface: letterpress, flexography; flat surface: photo-offset lithography; sunken surface: gravure; through the surface: screening; non-impression: ink jet; b) advantages and disadvantages of the various methods; usage trends.
24. Introduction to advertising	<ul style="list-style-type: none"> a) Analysis of the main purposes of advertising; the creators of advertising – agencies, newspapers, magazines; analysis of the traditional types of advertising; introduction to the planning and copy writing of an advertisement.
25. Safety and health	<ul style="list-style-type: none"> a) Proper handling and storage of chemicals and materials; action to be taken in emergencies; safety procedures in the use of tools and the operation of machinery; b) introduction to work-flow features and traffic-flow patterns.
26. Graphic art and design	<ul style="list-style-type: none"> a) Design and finished art – general methods of preparation; specific techniques associated with major methods of printing; b) balance; harmony; contrasts; proportion; role of material; colour; package design; promotion materials.
27. Introductory principles and practices of typography	<ul style="list-style-type: none"> a) History and development of hieroglyphics, letters, the alphabet, and typefaces; basic classification of typefaces; printers' systems of measurement; b) basic classification of typefaces – Roman, italic, sans-serif, contemporary, cursive, and text; organization of type – family, series (point sizes), fonts; electronic typesetting; typographic principles of typesetting – legibility, readability, contrast, proportion, harmony; rules and borders, an introduction to their appropriate use; elementary mark-up and copy fitting.

28. Creating layouts	<ul style="list-style-type: none">a) Introduction to creating layouts – purpose of layouts, steps in developing a layout; elementary principles of typographic design; introduction to layout tools;b) proportion, balance, harmony, contrast.
29. Typesetting practices	<ul style="list-style-type: none">a) Basic typesetting system – typesetting capabilities of the equipment and procedures; basic typographic skills; justification, flush left, flush right, and centring;b) brief history of typesetting from block printing to the latest electronic methods of producing texts.
30. Proofreading and copy editing	<ul style="list-style-type: none">a) Proofreading codes; necessity for and practice of proofreading;b) visual, mental, and manual dexterities; role of the copyreader and the proofreader; kinds of proofs submitted for proofreading.
31. Paste-up, mechanical construction, and hand ruling	<ul style="list-style-type: none">a) Paste-ups – purpose, equipment, tools, and supplies; basic paste-up practices; single-colour paste-up projects; review of mathematics and printers' measurement as employed in paste-up construction;b) paste-ups – purpose, system, glossary of terms; equipment, tools, and supplies; interpreting a layout; basic paste-up practices, including all aspects of basic paste-up construction; review of mathematics and printers' measurement; introduction to hand-ruling practices.
32. Process camera	<ul style="list-style-type: none">a) Theory of the process camera; types of process cameras – vertical, horizontal, daylight cameras; construction of process camera; reflective grey scales – purpose, use, interpretation; generating a line shot;b) calibrating a process camera to establish a basic line shot exposure; enlarging and reducing procedures; use of the ground glass; generating half-tones.

33. Darkroom fundamentals

- a) Darkroom layout, equipment, operating practices; lithographic film process – chemicals required to process film into negatives, manual tray development process; metric (SI), imperial, and U.S. measurements; cleanliness, maintenance, and safe working practices in the darkroom;
- b) lithographic film – film construction, manufacture, types, storing, and handling; chemical mixing (wet and dry, health and safety considerations), theory of development, negative drying and drying equipment, negative evaluation; time and temperature method of film processing; half-tone film – chemistry and developing procedures (tray method, time, temperature); magnifying glasses – types, powers, maintenance; inspecting, evaluating, and interpreting half-tone negatives; measuring dot percentages;
- c) sebbattier effect; solarization; posturization; double-exposure printing; selective contrast control.

34. Diffusion transfer processing

- a) Theory of diffusion transfer; main manufacturers of papers and corresponding chemicals; the variety of camera shots utilizing the various papers; diffusion transfer contact screens and half-tone generation; maintenance of diffusion transfer equipment.

35. Screen tints and special-effect screens

- a) Purposes of screen tints.

36. Contact printing

- a) Purpose of contact printing; exposing and processing procedures;
- b) contact printing equipment and set-up; contact films and their purposes; using contact and duplicating processes to produce a variety of image results.

37. Stripping procedures

- a) Purpose and function of stripping; equipment, tools, and supplies; preparation of negatives for stripping; basic stripping procedures for single-colour work and using preruled masking sheets; lith tape and opaquing procedures; checking finished job and labelling with plate-exposing instructions;
- b) reading and interpreting job requirements; ruling a plain masking sheet for basic stripping; full stripping procedures in preparing a flat; basic two-colour stripping.

38. Proofing methods and systems	a) Purpose of proofing, equipment, and viewing standards; proofing systems; introduction to proofing procedures for single- and two-colour proofing.
39. Offset platemaking procedures	a) Introduction to platemaking equipment in respective laboratory; exposing and processing offset plates; b) common types of offset plates and how each works.
40. Lithographic offset press printing	a) Basic offset press construction; complete set-up of an offset press; operation of an offset press; plate handling; press clean-up methods, maintenance; safe operation and safety controls; pressroom organization, cleanliness, safety; b) history of lithographic stone printing; principles of offset printing – controls, ink and water balance, image position, image colour; monitoring offset press during the press run and evaluating printed products; inks and chemicals for offset press printing; press lubrication and night latch settings.
41. Bindery procedures	a) Purpose and general processes of the bindery department; bindery operations (where equipment is available) – folding, drilling, stitching, padding, power cutting, combo binding operations (related to curriculum projects).
42. The basic camera	a) Purpose and function of parts; b) viewing systems; film plane; camera body; diaphragm; shutter; lens; focusing control; the inverted image; film advance.
43. Major types of cameras	a) Viewfinder; single-lens reflex; twin-lens reflex; view (studio) camera; advantages, disadvantages, and uses of each type; types of shutters; built-in light meters; parallax error; film sizes used; b) rangefinder; viewing system in each type; fixed-focus lenses; interchangeable lenses.

44. Exposure controls on the camera

- a) Aperture as a controller of light; shutter speed as a controller of light; standard aperture; standard shutter speeds; ISO setting;
- b) exposure values using aperture and shutter speed;
- c) ASA settings, stopping up/down;
- d) ISO/ASA setting;
- e) use of equivalent exposure values; stopping up/down; use of light meters;
- f) double-exposure methods.

45. The lens

- a) Purpose of a lens compared to pinhole; control of depth of field; use of information on lens barrel;
- b) simple lens – purpose, use of information on lens barrel;
- c) compound lens; control of depth of field; lens problems;
- d) visual effects of lenses of various focal lengths; close-up photography and lens equipment;
- e) normal lens; wide-angle lens; organization of light rays by refraction; zoom lenses; special lenses; optimum aperture; focusing infrared light;
- f) special lenses.

46. Film

- a) Construction of film; emulsion; silver bromide crystals; negative-to-positive principle; latent image;
- b) light sensitivity – ISO/ASA;
- c) film speed and relationship to grain, contrast, sharpness;
- d) latitude; standard film sizes; storage and longevity of film; f16 rule for exposure calculations; different types of film and their uses;
- e) positive film; spectral sensitivity.

47. Processing b/w film

- a) Purpose and function of the three main chemical solutions – developer, stop bath, and fixer; calculation and importance of controlling the developing time; temperature of chemicals and consistency in agitation; processing procedures; proper washing, drying; mixing and storing chemicals;
- b) use of wetting agent; hypoclearing agent; drying types of developers and their uses; developing agents and their properties; developing methods – replenishment versus process and dump.

48. Printmaking

- a) Procedure for contact printing (emulsion to emulsion); parts and use of enlarger; step-test exposures; processing b/w paper; chemicals – importance of timing, temperature; contrast; washing and drying;
- b) dodging; burning in;
- c) printing controls – dodging, burning in; types and qualities of printing paper; toners and toning; procedures for printing techniques; texture screens and easel correction/distortion; print exposure control;
- d) developing; stop bath, fixing; continual agitation in the developer; b/w print paper; b/w enlarging paper – weight, tone, and texture; choosing the correct contrast in paper; print exposure controls; double exposures.

49. Understanding light

- a) Soft light; hard light; sources; visual effect on a subject of frontal, side, and back lighting;
- b) window lighting plus fill;
- c) qualities of light; soft light; hard light; basic portrait lighting; contrast control and lighting ratios; recognizing and using qualities of available light to show form, texture, and pattern and to create mood;
- d) use of flash and flash techniques of lighting; lighting techniques in a studio;
- e) overhead lighting; establishing a 3:1 lighting ratio; lighting techniques; isolating the subject; tent lighting; barn doors and screens.

50. Use of the light meter

- a) Reflected light readings; understanding the reflective values of the subject and reading those areas in the picture where detail is desired; setting the ASA; setting the dial to the value indicated by the meter; reading and selecting the correct exposure value; understanding reasons for the selection of exposures, shutter speeds, and apertures.

51. Composition

- a) Rule of thirds; tones and contrast; background detail; mass and area;
- b) balance;
- c) elements; tone; line; direction of movement; perspective and weight of line; form and shape; tones and shapes; pattern and texture; repetition or symmetry; angle of view; use of perspective to dramatize; infinity points; background detail; framing; elements.

52. Print finishing	a) Dry mounting procedures; protection of prints; various ways of presenting prints; b) flat mounting, wrap-around mounting, matting, frames (handmade and commercial); c) procedures for matting a print for presentation.
53. Design concepts	a) Balance; harmony; contrasts; proportion; role of material; colour; package design; promotion materials.
54. Colour processing	a) Colour temperature theory; colour cast; trouble-shooting; colour keys.
55. Portraiture	a) High key; low key; catch lights; broad lighting; short lighting; lighting for character.
56. Movie cameras	a) Types of cameras; handling and setting; animation sequence; superimposing; slow motion; zooms.
57. Television production	a) Program researching; scripts; graphics; props; colour theory; electromagnetic spectrum; production; splicing; equipment handling; direction.
58. Creative photography	a) Movement through multiple exposures; sequential images; abstract composition; photograms; microscopic techniques; over-exposures and underexposures; distortions.
59. Silkscreen printing	a) Equipment; preparation of frames; stencils; inks; block-outs; flocking; printing on various materials and irregular shapes.
60. Pinhole camera	a) Basic shape; the path of light; inverted image; construction of simple camera; loading and use of film or paper; contact printing a negative film or print.
61. History of photography	a) Discovery of light-sensitive compounds; early uses of photosensitive materials; image retention problem; Joseph Niepce; early processes – calotype, daguerreotype, wet plate; George Eastman; early use of cameras and various designs; William Henry Fox Talbot; wide range of uses of photosensitive materials today.

62. Contrast in photography	<ul style="list-style-type: none"> a) High- and low-key prints; manipulating (increasing and decreasing) contrast from abnormal and normal negatives; fogging; b) contrast from film; developing procedures, printing paper; flashing; fogging; multi-grade printing papers; manipulating (increasing and decreasing) contrast from abnormal and normal negatives; lighting – 3:1 ratio; types of developers; c) D log E curve; lenses; high- and low-key prints.
63. Filters	<ul style="list-style-type: none"> a) Visual effects of specialty filters; using filters to alter contrast and tone in b/w; filter factors and exposure.
64. Basic colour theory	<ul style="list-style-type: none"> a) Photographic colour wheel – subtractive and additive colours; use of complementary colours in the subtractive system of printing; additive system of printing; use of complementaries and silver in exposure of film layers to colour; b) light and Kelvin degrees; variables in colour temperature of various light sources; colour enlargers; electromagnetic spectrum.
65. Photograms	<ul style="list-style-type: none"> a) Contact printing; processing of paper; negative-to-positive photograms; combination photogram and projected image.
66. High-/low-key prints	<ul style="list-style-type: none"> a) Tonal values in prints; control of tone in lighting; subject, background, and printing controls.
67. Pushing film	<ul style="list-style-type: none"> a) Purpose; procedure; effects.
68. Camera use and double-exposure methods	<ul style="list-style-type: none"> a) Necessary lighting and background control; b) procedure to override camera double-exposure prevention; use of flash to create multiple images.
69. Use of graphic arts film	<ul style="list-style-type: none"> a) Safelight required; uses of high-contrast film in photography applications; exposure, handling, and processing procedures.
70. Vintage processes	<ul style="list-style-type: none"> a) Historic use of process; safety in handling, measuring, and mixing chemicals; Van Dyke; cyanotype; gum bichromate; use of graphic arts film.
71. Reading mechanical engineering prints	<ul style="list-style-type: none"> a) Interpreting and identifying true shape and characteristics of item(s) shown on drawings; b) interpreting drawings that involve tolerance dimensioning.

72. Basic shop mathematics	a) Adding, subtracting, multiplying, and dividing as required to determine size description from blueprints of components; b) calculating dovetail dimensions; doing gear calculations.
73. Structural steel components	a) Identifying structural components using AISC symbolic notation; doing a material "take-off" from a typical structural steel blueprint and calculating weights of members.
74. Power transmission	a) Spur gears; bevel gears; cams; activators; calculations related to gear design; cam motion diagrams.
75. Electrical/electronic blueprints (schematics)	a) Component identification – symbols, terminology; simple electrical circuits; electromechanical devices.
76. Welding fabrication	a) Structural shapes; weld symbols; welding rod specifications; welding jigs and fixtures; applied mathematics.
77. Architectural (construction trades) blueprints	a) Standard residential working drawings; commercial buildings; heating and ventilating drawings; mechanical installations.
78. Principles of tolerance	a) Tolerances and allowances, limits; tolerancing methods; fits; notation.
79. Engineering materials	a) Metals and alloys, terminology related to strength and plasticity; heat treatment; hardness testing; SAE numbering system; ferrous and non-ferrous metals; non-metallic materials; notation.
80. Basic manufacturing processes	a) Casting processes, forging, pressing, machining, fabrication (welding), extruding; symbolic representation and notation related to manufacturing processes.

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
4. Food Services Grouping	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
5. Graphics Grouping	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
5. Graphics Grouping	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
5. Graphics Grouping	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMH
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Drafting (Grades 9-10)

*Drafting – Architectural, Electrical, Mechanical,
and Comprehensive (Grades 11-12)*

Blueprint Reading and Sketching (Grades 9-12)

Graphic Communications (Grades 9-12)

Photography (Grades 9-12)

Vocational Art (Grades 10-12)

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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*6. Horticulture
Grouping*

Module 1, 1987



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Introduction to the Horticulture Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, Part B, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. Part A provides essential background for the planning of all courses in technological studies. The following three sections in Part A are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of Part B are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in Part B is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the horticulture grouping. The grouping includes five subjects: general horticulture, landscape design and maintenance, nursery production, greenhouse production, and floral design. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, such involvement will be their initial introduction to one of the occupational areas within the horticulture grouping. For some, it will be the first step towards an apprenticeship in general horticulture. For others, it will be an introduction to other occupations in the industry, such as gardener or florist. Some students will go on to postsecondary studies. While each of the five subjects outlined in this document deals with content that is unique, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses under any of these five subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic, general, and (where authorized) advanced level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined as core

content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

While in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Many of the suggestions, although they appear in a particular section, have wide applicability. Teachers are encouraged to review sections other than the ones that directly concern them and to adapt whatever suggestions are appropriate. One way of finding appropriate suggestions is to refer to the comprehensive list of content in chart 6.1.11 and, where core content is common to two or more subjects, to probe the suggestions for teaching the other subject(s).

Relevant sections of the Workers' Compensation Act and the Occupational Health and Safety Act should be discussed. Where these are written in complex language, the statements should be clarified for students.

Course objectives

All courses will be planned to achieve specific objectives, which should be based on the aims for courses at the basic, general, and advanced levels. The nature of the aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content.

Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Horticulture Grouping", at the end of this module, or from the course content listed at the end of any other module in Part B.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the horticulture grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Horticulture Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 6.1.11 provides a summary of the core content for all courses in the horticulture grouping. This summary chart is a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Horticulture Grouping". Topics appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the photography section in the graphics component may be incorporated into the floral design program if appropriate to a particular theme or project.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant

overlaps in course content. Although two such courses may mutually reinforce basic concepts in horticulture, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 10 general horticulture, basic and general levels) or at different grade levels (e.g., nursery production, Grades 11 and 12) are becoming more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Horticulture courses based on this module are to a large extent skills oriented. As students develop skills, they are motivated to acquire related knowledge and the attitudes they will need to succeed in work situations. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is potting a plant or preparing a planting area. Significant aspects of the completed operation are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in horticulture courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge

successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's achievement on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained from these experiences is particularly important to today's young people, who face a working life characterized by changing technology and the need to continually update their skills and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should have opportunities to become aware of the various tasks that computer technology performs in the horticulture industry. A visit to a large greenhouse production centre can show students how computer technology is used to schedule production, access records and inventory, control environmental conditions in a greenhouse, and do a variety of other tasks.

General Horticulture

Intermediate Division

(Grades 9 and 10)

Courses in general horticulture offered in the Intermediate Division introduce students to the skills and knowledge required for a wide range of horticultural activities. Students taking courses in this subject will acquire general knowledge about botany, plant propagation, plant identification, soil science, and landscape planning and design.

Courses in horticulture focus on the application of scientific principles. The skills and knowledge provide an excellent basis for occupational training in this field and can be readily adapted for students with exceptional needs.

The learning may be applied by students to both personal and vocational goals. For some students, the course will be a stepping stone to further study in Grades 11 and 12. Other students will use the skills and knowledge developed in this course to improve the landscapes in and around their homes.

Courses in general horticulture are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 6.1.1

identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in general horticulture may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. Courses that are offered entirely in school may therefore range from one-quarter credit to two credits in any one year. Co-operative education components (described on pages 13 and 14 of *Technological Studies, Part A: Policy for Program Planning*) may be planned to support the in-school course work and to provide additional credits in this subject.

If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that core items be chosen to increase practical skills that may eventually lead to employment.

Chart 6.1.1
Core Content for
General Horticulture
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses		
	Basic	General	Advanced
1. Introduction and opportunities			
1.1 Career description and opportunities	a	ab	ab
1.3 Economic effects	a	a	a
2. Safety			
2.1 Accident prevention and safety rules	a	a	a
2.2 Precautions in the use of hazardous materials	a	a	ac
2.3 Legislation		a	ac
2.4 Tools and equipment	a	a	a
2.5 Accidents	a	a	a
2.6 Working environment	a	a	a
3. Tools and machinery			
3.1 Power units	aef	abef	abdef
3.2 Hand tools	ade	ade	abcde
3.4 Schedules and manuals	a	a	a

Content Units	Core Content for Courses		
	<i>Basic</i>	<i>General</i>	<i>Advanced</i>
4. Plant science			
4.1 Plant anatomy	a	bcd	bcd
4.2 Plant development	a	ad	ad
4.3 Plant classification	a	ac	abc
4.4 Uses for plants	a	ad	ad
5. Plant propagation			
5.1 Sexual reproduction	ad	acd	abcd
5.2 Asexual propagation	a	ab	abc
6. Plant identification			
6.1 Naming	a	ab	abc
6.2 Definitions	ad	abc	abcde
6.3 Plants for identification using common and/or botanical names	ac	acin	acin
6.4 Plant recognition techniques	a	a	ab
6.5 Identifying plants for specific uses		d	cd
8. Plant culture and production			
8.1 Greenhouse crops	a	a	a
9. Soils and fertilizers			
9.1 Soil science	ac	acde	abcd
9.2 Physical, chemical, and biological features of soil	adf	abf	abcdf
9.3 Fertilizers	ab	ab	ab
9.4 Soil mixtures	a	ab	ab
12. Grounds maintenance			
12.1 Lawn maintenance	a	abc	abcde
12.2 Planting area maintenance	acd	acd	acd
12.3 Plant maintenance	b	b	b

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THO1B for Grade 9 and THO2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe work habits and a positive attitude towards the safety of others;
- learn to select and use hand and power tools and equipment;
- work co-operatively with peers and supervisors;
- acquire basic knowledge of plant structures, growth, processes, reproduction, and classification;

- acquire basic knowledge of plant terminology and learn to identify common greenhouse and bedding plant crops;
- acquire an understanding of the formation and physical features of soil and the importance of maintaining soil fertility;
- learn basic grounds maintenance procedures and the skills required to perform them;
- improve their ability to communicate about horticulture;
- be introduced to the horticulture industry and the various occupations associated with it.

Suggestions for Teachers

In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to learn. Teachers can bolster confidence by providing students with many opportunities to experience success. Providing such opportunities is a challenge to the teacher's powers of observation, imagination, and patience. Wherever possible, learning should be related to the students' language and mathematical studies in order to reinforce the importance of these subjects in the field of horticulture.

Units 2 and 3 involve safe procedures for using tools, machinery, and other horticultural equipment. In discussing topics from these units, students should develop an appreciation of how safety awareness helps to prevent accidents both in the shop and on the job site. The hazards associated with the operation of tools and machinery should be discussed not only when correct uses are taught but also whenever incorrect uses are spotted. Safety handouts from such sources as the Industrial Accident Prevention Association (IAPA) can be added to notebooks.

Unit 6 provides for instruction in the identification of annual and perennial herbaceous and woody plants. The expectation in the horticulture industry is that graduates will be

readily able to identify plant material commonly used in the industry. Daily exposure to labelled plants suitable for both interior and exterior locations can do much to facilitate this objective. The use of common names is essential. A number of schools have found that nurseries and local parks departments are willing to make donations to class plant collections, especially in the late fall.

The evaluation of student achievement in courses planned for the basic level of difficulty must recognize the emphasis placed on practical activity. Individual oral testing often benefits a student who has difficulty with written material. Students may be asked to demonstrate a particular task, knowing the criteria on which marks will be based. When written tests or assignments are given in class, they should be brief and clear and should deal with a manageable unit of work. In all cases, the criteria for assessment should be made clear to students at the outset. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

As an optional experience, teachers can explore interior landscaping. This subject can be

an exciting complement to the topic of exterior landscaping. Many magazines provide illustrations and ideas that can be tried.

The extent of skill development that is possible in a course depends on the time allocated to the course. Where the Grade 9 course forms part of an exploratory shop round and is less than fifty-five hours in length, the Grade 10 course should be assigned sufficient time to allow coverage of the core learning.

The following are the kinds of activities that can be included in a general horticulture course:

- Field trips can be made to several horticultural businesses in the school area.
- Students can conduct experiments to explore plant processes.
- The many variables that affect seed germination can be demonstrated.
- Students can propagate plants in the greenhouse or nursery.
- Students can identify plant materials in the class and on school property.
- A class or an individual can produce a quality greenhouse crop.
- Students can carry out experiments to investigate the formation, structure, texture, and organic matter content of soil.

- Students can grade a small area of tilled soil and grow selected varieties of turf grasses on it.

Many activities planned to meet objectives in general horticulture require a greenhouse and a potting room. A fenced area that accommodates both a nursery and a turf-management area is also desirable. However, the school grounds can serve as the major facility for much of the core content. In addition, an artificial lighting system, planned to provide correct intensity, quality, and duration of light, can be used in many of the activities. Tours of local parks and horticultural firms in the community can compensate for any shortcomings in the school facilities.

Publications and other resource materials for use in general horticulture courses can be obtained from a variety of sources. The provincial Ministry of Agriculture and Food, for instance, publishes a variety of materials on horticultural topics. This ministry's Publication 381, *Pesticides Recommendations for Greenhouse Ornamentals*, is a regularly updated series that is available to ensure correct use of pesticides. Each classroom should also have a current copy of the Ontario Pesticides Act and regulations.

General Level

Course codes assigned to general level courses planned under this section will be THO1G for Grade 9 and THO2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop an awareness of safe behaviour in the workplace and the safe use of tools, machinery, and protective clothing and equipment;
- acquire and develop skills in the selection and use of hand and power tools and equipment;
- develop the ability to work co-operatively with peers and supervisors;
- acquire and develop understanding of plant structures, growth, processes, reproduction, and classification;
- acquire an understanding of plant terminology and the ability to identify common greenhouse, bedding, landscape, and vegetable plants;
- understand soil formation, plant nutrient requirements, and fertilizers and learn to produce a soil mixture that will satisfy a wide range of plants;

-
- acquire knowledge about general grounds maintenance procedures and the ability to perform the required operations;
 - acquire and develop the communication skills necessary for horticultural activities;
 - be introduced to various occupations associated with the horticulture industry.
-

Suggestions for Teachers

Teachers planning courses at the general level of difficulty should review the comments and suggestions for teachers in the preceding section for the basic level.

Courses at the general level of difficulty place a greater emphasis on the theoretical aspects of general horticulture than do courses at the basic level. The practical work nevertheless remains the major means of delivering course content.

Teachers should structure their courses to take advantage of the various festive seasons by creating appropriate themes and planning their plantings. Poinsettia cuttings can be planted in early September to be ready for the Christmas season, and Easter lily bulbs can be planted in time to bloom for Easter. In general level courses, students should be required to keep accurate records on the production of these plants.

Safety is of primary importance and should be stressed throughout the course. Most students find that conducting a safety audit of the shop (aided by a safety checklist) is an interesting activity. Students need to be made aware as well of the safety requirements on the worksite in the field.

Coverage of units 2 and 3 should include a discussion of accident awareness both in the shop and on the job site. The hazards associated with the operation of tools and machinery should be discussed not only when correct uses are taught but also whenever incorrect uses are noted.

Possible topics in unit 4 include photosynthesis, assimilation, respiration, transpiration, translocation, digestion, and reproduction.

An understanding of these topics will help students to understand units 5, 8, and 9. In these three units, special emphasis should be placed on the propagation and culture of plants common to the area in which the school is located.

Unit 6 provides for instruction in the identification of annual and perennial herbaceous and woody plants. Although a plant key is valuable, it is rarely used by horticultural workers in the field. The expectation in the horticulture industry is that graduates will be able to identify readily, without a key, plant material commonly used in the industry. Daily exposure to labelled plant material can do much to facilitate this objective. The use of common names is essential.

General level courses should emphasize the basic steps necessary to construct a good turf foundation, to follow a landscape plan, and to establish plant and structural materials on a site.

Evaluation of student progress should be related to the student's success in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should reflect practical skill development. The remaining 40 per cent of the final mark should reflect the student's understanding of theoretical principles and ability to use horticultural information in work-related activities. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be THO1A for Grade 9 and THO2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- understand the theoretical aspects of grounds maintenance and carry out the practical procedures;
- acquire an understanding of elementary soil science, fertility, fertilizers, and soil mixtures;
- acquire an understanding of plant terminology and scientific nomenclature and the ability to identify (using botanical and common names) a number of plants commonly found in greenhouses and in the landscape;
- acquire an understanding of plant structures, plant development, factors that can alter plant development, plant reproduction, and methods of plant classification;

- expand their ability to communicate about horticulture;
- develop the ability to plan and perform tasks efficiently using a logical sequence of operations;
- learn to select and use horticultural tools and equipment;
- make safe use of tools, machinery, and protective clothing and equipment and acquire general knowledge of safety procedures;
- develop a positive attitude towards co-operative work;
- acquire insight into the various types of jobs and job descriptions that the horticulture trade encompasses.

Suggestions for Teachers

Suggestions for teachers in the preceding sections for basic and general level courses can be reviewed and adapted to the planning of advanced level courses.

Students taking courses at the advanced level of difficulty should be expected to do a research assignment based on one of the topics covered in the program. Oral presentations by students of their findings will reinforce and further develop communication skills.

Scientific experiments should be included in the course. Students may investigate soil components and qualities, the effects on plant growth of light and/or fertilization, or moisture stress in plants.

Where time permits, optional content may be selected from other subjects within the horticulture grouping or from related subjects, such as drafting or design studies, in other groupings. The optional content in each case should be selected to fit learning objectives planned for the course or particular themes selected as

teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of the topics as independent study, particularly in bi-level courses, where the advanced level may be differentiated from the general level through the use of enrichment topics, differing themes, and special task assignments and projects. Independent exploration can be encouraged through the assignment of written research projects and oral presentations of technical reports. The independent study approach works especially well with gifted students and those who show a particular interest in the course. To incorporate the concept of “language across the curriculum”, evaluation of these assignments and reports should consider the student’s use of language as well as the technical content.

Emphasis should be placed on developing thinking skills related to practical problem solving. Activities in advanced level courses should focus on data-gathering and problem-solving tasks to a greater extent than is usual in general level courses. This difference in focus should be reflected in the objectives set for the course.

Students in advanced level courses should be evaluated for achievement in both the theoretical and the practical components of their courses. Approximately 50 per cent of the final mark should be based on the practical work associated with class assignments, scientific experiments, and independent project work. The results of formal examinations should constitute about 30 per cent of the summative assessment for each course; such examinations

should reflect the relative emphases on the various objectives of the course (as indicated by the times allocated for achieving the objectives). The remaining 20 per cent of the final mark should be based on regular tests that assess the acquisition and application of specific theoretical information.

Teachers should introduce information on career opportunities whenever possible, through newspaper and magazine articles, films and filmstrips, and career speakers from industry. School guidance counsellors can be another useful resource.

General Horticulture

Senior Division

(Grades 11 and 12)

The trade of horticulturist embraces a wide variety of skills associated with landscaping, greenskeeping, grounds and parks maintenance, and greenhouse, nursery, and garden centre operations.

Courses for students who plan to enter apprenticeships as horticulturists must provide them with opportunities to acquire skills that are basic to the trade. The training profile for this trade, produced by the Ministry of Skills Development, outlines the performance objectives and standards that have been identified by the industry. Where appropriate, the content of the basic apprenticeship course outlined in this training profile may be incorporated into Senior Division courses.

Courses based on the following three sections are intended to exhibit *growth stranding*. That is, core and optional topics should be explored in greater depth and breadth each time they are structured into a course, throughout the program. Growth stranding continues into college training programs.

Courses in general horticulture at the basic and general levels of difficulty should stress practical elements; courses at the advanced level, theoretical elements.

One ongoing concern of the horticulture industry is its merchandising and marketing effectiveness. Seminars and trade journal articles tend to focus on the basics of applied marketing techniques. The average employer

in this field seeks new employees who understand sales techniques, are able to communicate with customers, have a reasonable level of product knowledge, and are able to handle cash and follow basic stock- and sales-control procedures. Sales techniques should be given priority in course objectives for this area.

In order to acquire first-hand information on employment opportunities and the availability of on-the-job training, Senior Division students should participate in work experience and co-operative education. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

The focus of postsecondary programs for technicians and technologists in the horticulture field is different from that of apprenticeship and adult-training programs. Students who are planning to study at the postsecondary level will need to be competent in both mathematics and English.

Courses in general horticulture are authorized for Grades 11 and 12 at basic, general, and advanced levels of difficulty. Chart 6.1.2 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 6.1.2
Core Content for
General Horticulture
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses		
	Basic	General	Advanced
1. Introduction and opportunities			
1.1 Career description and opportunities	cd	cd	cd
1.2 Further training	a	ab	ab
1.3 Economic effects	b	ab	ab
2. Safety			
2.1 Accident prevention and safety rules	ab	ab	ab
2.2 Precautions in the use of hazardous materials	bc	bcd	bd
2.3 Legislation	a	b	bd

Content Units	Core Content for Courses		
	<i>Basic</i>	<i>General</i>	<i>Advanced</i>
2.6 Working environment	b	b	b
3. Tools and machinery			
3.1 Power units	bd	cd	c
3.2 Hand tools	bc	bc	
3.3 Moving equipment	a	ab	ab
3.4 Schedules and manuals	b	b	b
4. Plant science			
4.1 Plant anatomy		ef	ef
4.2 Plant development		bce	bce
4.3 Plant classification		bd	cd
4.4 Uses for plants	cd	bc	bc
5. Plant propagation			
5.1 Sexual reproduction	fi	befhi	efghi
5.2 Asexual propagation	bei	cdefi	defgi
6. Plant identification			
6.1 Naming	bc	c	
6.2 Definitions	bce	de	
6.3 Plants for identification using common and/or botanical names	in	bdj	bdj
6.4 Plant recognition techniques	b	b	
6.5 Identifying plants for specific uses	ac	abc	abef
7. Plant protection			
7.1 Insects	cd	cdf	cdef
7.2 Diseases	ac	abcd	abcde
7.3 Weeds	ad	abcd	abcde
8. Plant culture and production			
8.1 Greenhouse crops	bf	bcf	
8.2 Vegetable crops		ac	abc
8.3 Fruit crops		a	ab
9. Soils and fertilizers			
9.1 Soil science	be	bfg	efgh
9.2 Physical, chemical, and biological features of soil	chk	cdeghk	eghijkl

Content Units	Core Content for Courses		
	Basic	General	Advanced
9.3 Fertilizers	bcef	cdef	cdef
9.4 Soil mixtures	bcd	cde	cde
10. Landscape planning and design			
10.1 Residential and/or commercial landscape design	cf	acf	abcfg
10.4 Landscape drafting and surveying	ac	abcg	abcdg
11. Landscape construction			
11.3 Planting	agh	abcdg	abcdeg
12. Grounds maintenance			
12.2 Planting area maintenance	b	b	b
12.3 Plant maintenance	ac	ac	ac
12.4 Maintenance programming		a	a
14. Greenhouse structures, systems, and construction			
14.2 Types and layouts	a	ab	abc
14.3 Construction materials and designs	ac	abc	abc
15. Nursery and greenhouse sanitation			
15.1 Sanitation	ab	abc	abc
15.2 Problem areas	bc	bc	bc
17. Merchandising and marketing			
17.3 Merchandising and display	ae	acef	acdef

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THO3B for Grade 11 and THO4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- set up an area in the shop or school from which to merchandise plant materials grown in the shop;

- acquire basic knowledge of landscape design and the ability to prepare a simple landscape plan;
- acquire basic knowledge of greenhouse types, structures, and construction materials;

- develop an understanding of soil science, fertilizers, and soil mixtures and the skills required to produce a good growing soil;
- learn to identify common indoor and outdoor plants using botanical and common names;
- develop an understanding of the uses of plants and the ability to propagate plants in various ways;
- learn the importance of adjusting and maintaining tools and equipment and techniques for performing simple adjustments and maintenance;
- acquire an understanding of safety and its importance to their general welfare and some knowledge of safety legislation;
- develop the ability to work with others and to take orders from superiors;
- acquire knowledge of career and employment possibilities, opportunities for further training, and the economic importance of the industry;
- develop the communication skills they need to qualify for and succeed at jobs in the horticulture industry.

Suggestions for Teachers

Stress should be placed on hands-on work. In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to learn. Teachers can promote confidence by providing opportunities for success. Ensuring students' success is a challenge to the teacher's powers of observation, imagination, and patience. Wherever possible, learning should be related to the student's language and mathematical studies in order to reinforce the importance of these subjects in the field of horticulture.

It is important for safety to be an integral and ongoing part of the program. Students must be carefully instructed in the operation of all power equipment, and every effort must be made to develop in students a positive attitude towards safe work habits. The mixing of gasoline and oil should be discussed, and proper facilities provided for storing these substances. Neatness in the shop, including correct storage of tools and equipment, will help prevent accidents.

Students in the basic level program should have the opportunity to be involved in a well-organized work experience or co-operative education program. Participation in such programs will give students much better insight than classwork alone into both the horticultural trade and work in a business setting.

Projects should be planned that will help students develop their ability to work co-operatively as members of a group and to assume leadership when called upon.

In Senior Division, horticultural theory should be part of the basic level program, although

the program should continue to be mainly practical. When evaluating students, it is important for teachers to place a greater emphasis on the practical projects and to assess progress in theoretical work with a series of short tests. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Courses offered at the basic level of difficulty should emphasize the development of practical skills related to units 3, 5, 8, 9, 10, 11, and 12.

Many activities planned to meet the objectives of courses in general horticulture require a greenhouse and a potting room. A fenced enclosure containing a nursery and a turf-management area is also desirable. However, the school grounds can serve as the major facility for much of the core content. An artificial lighting system, planned to provide correct intensity, quality, and duration of light, can be used in many of the activities. Tours of local parks and horticultural firms in the community can serve to make up for any shortcomings in the school facilities.

The following are the kinds of activities that can be included in a general horticulture course:

- Field trips to, and/or visits by supervisors from, various local horticultural businesses can be arranged.
- Students can conduct experiments in botany in order to further explore the processes suggested by the lessons.

- The many variables that affect seed germination can be demonstrated and investigated in class experiments.
- Students can propagate plants in the greenhouse or nursery.
- Students can identify plant materials in the class and on school property and maintain a class collection.
- The class or an individual can produce a quality greenhouse crop.
- Students can investigate the formation, structure, texture, and organic matter content of soil.
- Students can grade a small area of tilled soil and produce varieties of turf grasses on it. Correct selection and use of equipment for tilling, seeding, and fertilizing this area are practical aspects of the learning.

Suggestions for establishing a labelled collection of plants and for obtaining learning materials on a variety of horticultural topics are outlined under "Suggestions for Teachers" in the basic level section for Intermediate Division courses in general horticulture. These suggestions apply as well to Senior Division courses.

General Level

Course codes assigned to general level courses planned under this section will be THO3G for Grade 11 and THO4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- expand their safe work habits and their knowledge of safety requirements and legislation;
- merchandise shop-grown plant material in the shop and/or the school store, designing and developing sales areas and displays, setting prices, and controlling inventory;
- develop knowledge about the physical, chemical, and biological features of soils, plant fertility and fertilizers, and the preparation of good soil mixtures;
- learn to classify and identify greenhouse, bedding, and landscape plants not introduced in Intermediate Division;
- become familiar with plant structures, growth, processes, and classification and be able to perform various methods of plant propagation;
- develop the ability to follow written instructions and to identify and list procedures;
- acquire knowledge and skill concerning tool and equipment adjustments and maintenance and awareness of the legislation controlling the use and transportation of horticultural equipment on public roads;
- learn the importance of co-operating with the people they work with and for;
- acquire an understanding of landscape design, drafting, and surveying and produce a complete landscape plan;
- develop general knowledge about the types of greenhouses in use, interior layouts, and construction materials;
- develop knowledge about horticultural occupations, employment and training opportunities, and the economic importance of horticultural enterprises.

Suggestions for Teachers

Suggestions outlined in the preceding section for basic level courses may be adapted to courses planned for the general level. The comments about safety, work experience, and in-school facilities for practical work, and the suggestions for practical activities, apply as well to general level courses.

Study of unit 1 should provide an overview of horticulture from both the aesthetic and the economic points of view. In addition, students should be informed of opportunities in the field of horticulture. A brief historical overview with a few examples of old agricultural methods and great gardens can add interest.

For students in general level courses, opportunities for further education in postsecondary institutions (horticultural schools, colleges of applied arts and technology) should be discussed at appropriate times during the year.

The topics covered in unit 4 should assist students in understanding units 5, 8, and 9. Possible topics include photosynthesis, assimilation, respiration, transpiration, translocation, digestion, and reproduction. Fundamental systematic botany should be included at the general level. Theory should constitute about 40 per cent of general level course work.

Coverage of units 2 and 3 should include a discussion of accident awareness both in the shop and on the job site. The hazards associated with the operation of tools and machinery should be discussed as each item is introduced. Safety handouts obtained from sources such as the Industrial Accident Prevention Association (IAPA) can be added to

notebooks. Students often find that undertaking a safety audit of the shop (aided by a safety checklist) is an interesting activity to conduct a couple of times a year. Safety should be stressed throughout the course.

Evaluation of student achievement should be based on assessments of the student's progress in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should be based on assessments of the student's progress in developing and demonstrating practical skills. The remaining 40 per cent of the final mark should reflect the student's progress in learning theoretical principles and horticultural information and using this knowledge to solve problems related to the workplace. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be THO3A for Grade 11 and THO4A for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- promote and sell materials produced in the shop, designing sales areas and displays, setting prices, and controlling inventory;
- acquire the knowledge and skills required to design and draw a landscape plan for a property;
- understand soil science and plant nutrition and prepare soil mixtures for specific requirements;
- plan and design a greenhouse, indicating type, interior layout, and construction materials to be used;
- classify and identify a wide range of greenhouse, vegetable, fruit, and landscape plants using botanical and common names;
- develop knowledge of plant uses, systems of classification, structures, and growth and

the ability to propagate plants by several methods;

- improve their ability to communicate orally and in writing on scientific aspects of general horticulture;
- develop the skills to properly adjust and maintain horticultural tools and equipment and knowledge of the legislation that governs the use and transportation of materials, tools, machinery, and equipment on public thoroughfares;
- acquire knowledge of safety legislation and a personal commitment to maintaining safe working conditions in any activity;
- develop leadership skills as a means to co-operation and productivity in group work assignments;
- explore the opportunities for careers and further training and gain insight into the economic importance of the horticulture industry.

Suggestions for Teachers

Many of the suggestions in both the basic and general level sections should be considered for advanced level courses. At the advanced level, however, greater emphasis should be placed on both design and problem solving.

Courses at this level of difficulty should place considerable emphasis on the theoretical aspect of the content. Topics, projects, and problems in botany should be treated in greater depth. Wherever possible, students should be assigned individualized projects that are of particular interest to them.

To supplement the core content, teachers may select optional content from other subjects in the horticulture grouping or from related subjects in other groupings, such as photography or drafting from the graphics grouping. The optional content in each case should be selected to fit specific learning objectives planned for the course or particular themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students at this level of difficulty may undertake independent study, particularly in bi-level classes in which advanced level students are combined with general level students.

Additional suggestions for bi-level strategies are outlined in the introduction to this module.

Summative evaluation of student achievement should reflect the equal balance of theoretical and practical learning associated with advanced level courses in horticulture. The following weighting of marks is suggested: practical projects and work assignments, 40 per cent; independent projects and scientific experiments, 20 per cent; and acquisition and application of theoretical knowledge in problem solving and design, 40 per cent. Assessment of projects should include a measurement of the student's success in learning technological information through independent reading and investigation. Improvements in critical thinking and communication skills reflected in the student's reports on project assignments should also be recognized in the assessment. Assessment criteria for project work should be established and communicated to students when they undertake the project.

Landscape Design and Maintenance Intermediate Division (Grades 9 and 10)

Landscaping is the art of designing and producing an area of land that is both useful and beautiful. It includes modifying existing features of a landscape to create artistic, useful, or otherwise advantageous effects. Courses based on this subject should develop student abilities that are basic to the landscaping business. Students should acquire skills and knowledge that facilitate the correct selection, positioning, planting, and maintenance of plants; the creation and maintenance of turf; and the creation of soil and other types of materials.

Students may take these courses at either the basic or general level of difficulty to gain technical literacy in the subject for personal use, as part of a general education. They may also enrol in these courses to prepare for apprenticeships or to go directly to work in occupations related to landscaping. Students studying at the general level may take this course as preparation for postsecondary programs that include landscape development.

Courses in landscape design and maintenance are authorized for Grades 9 and 10 at basic

and general levels of difficulty. Chart 6.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. Courses that are offered entirely in school may therefore range from one-quarter credit to two credits in any one year. Co-operative education components (described on pages 13 and 14 of *Technological Studies, Part A: Policy for Program Planning*) may be planned to support the in-school course work and to provide additional credits in this subject.

If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that core items be chosen to increase practical skills that may eventually lead to employment.

Chart 6.1.3
Core Content for
Landscape Design
and Maintenance
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	a	ab
1.3 Economic effects	c	c
2. Safety		
2.1 Accident prevention and safety rules	a	a
2.2 Precautions in the use of hazardous materials	a	a
2.3 Legislation		a
2.4 Tools and equipment	a	a
2.5 Accidents	a	a
2.6 Working environment	a	a

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
3. Tools and machinery		
3.1 Power units	aef	abef
3.2 Hand tools	abde	abde
3.4 Schedules and manuals	a	a
4. Plant science		
4.1 Plant anatomy	a	bcd
4.2 Plant development	a	ab
4.3 Plant classification	a	a
4.4 Uses for plants	a	ad
5. Plant propagation		
5.1 Sexual reproduction	a	ad
5.2 Asexual propagation		a
6. Plant identification		
6.1 Naming	a	abc
6.2 Definitions	abc	abcfg
6.3 Plants for identification using common and/or botanical names	im	ikm
6.4 Plant recognition techniques	a	a
6.5 Identifying plants for specific uses	ab	abe
6.6 Collection of plants	ag	abc
7. Plant protection		
7.1 Insects	cd	abc
7.2 Diseases	ab	
7.3 Weeds	ac	ab
9. Soils and fertilizers		
9.1 Soil science	ab	abc
9.2 Physical, chemical, and biological features of soil	a	ad
9.3 Fertilizers	ab	ab
10. Landscape planning and design		
10.1 Residential and/or commercial landscape design	abc	abc
10.2 Landscape design for public areas	ac	abc

Content Units	Core Content for Courses	
	Basic	General
10.3 Interior plantscape design	a	ab
10.4 Landscape drafting and surveying	ab	ab
11. Landscape construction		
11.1 Estimating and costing	a	a
11.2 Construction and/or installation of landscape features	a	ab
11.3 Planting	abc	abcd
12. Grounds maintenance		
12.1 Lawn maintenance	acd	acd
12.2 Planting area maintenance	ac	ac
12.3 Plant maintenance	bc	bcd

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THL1B for Grade 9 and THL2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- learn to value safety in the use of tools, machinery, and protective clothing and equipment at the worksite;
- develop skills in the correct selection and use of hand and power tools and equipment;
- develop the ability to work co-operatively with peers and supervisors;
- acquire a basic understanding of plant structures, processes, growth, and classification;
- acquire the knowledge and skills needed to identify and classify common landscape plant material;
- acquire basic knowledge of the formation and physical features of soil and learn techniques for maintaining soil fertility;
- learn to perform basic grounds maintenance operations on lawns and planting areas and to identify common insect, disease, and weed problems;
- acquire and develop the ability to communicate about landscape design and maintenance;
- acquire and develop basic plant propagation skills;
- be introduced to the basic elements of landscape design (interior and exterior), landscape drafting, and landscape construction;
- be introduced to landscape design and maintenance as a field of the horticulture industry, learning the nature of the work involved in the associated occupations and the importance of the industry to the local economy.

Suggestions for Teachers

Courses in Grades 9 and 10 should be exploratory in nature. At the basic level, units 2, 3, 11, and 12 are of major importance. These units, and especially the associated manual skills, should be stressed. The academic portion of any course should be carefully adapted to student ability. The personal skills that students need to succeed on the job should receive considerable attention.

In unit 10, the emphasis should be on the principles of landscape design, as related to the public, private, and service areas of a residential home. Students should develop some familiarity with the use of drawing equipment and be able to draw the symbols used in landscape planning.

In unit 11, students should be introduced to the procedure for establishing plant and structural materials on a site according to a landscape plan.

In unit 12, student awareness of the importance of proper maintenance should develop from practical activities. Maintenance is essential if the landscaping that has been planned and established is to remain attractive.

The following are the kinds of activities that can be included in a course in landscape design and maintenance:

- Students can practise drawing landscape symbols.
- Students can collect, from newspapers and magazines, photographs of well-designed public, private, and service areas of apartment buildings.
- Students can wrap and stake newly planted trees and shrubs.
- Students can practise pruning a variety of trees and shrubs commonly found in landscaped areas.
- Students can plant and move plants around the school to learn planting skills and techniques.
- Teachers can make work experience arrangements with local firms to provide a real-world experience for students.

Wherever possible, the development of personal values should be a part of the learning experience.

Facilities for these courses should include large land areas (such as planted areas on the school grounds), nursery areas, and turf-demonstration plots. Access to nearby residential homes, in co-operation with the owners, can greatly extend the classroom. All of these land areas should be located as close to the school buildings as possible, should contain reasonably good soil, and, if possible, should be protected by fencing.

Publications and other resource materials for use in landscape design and maintenance courses can be obtained from a variety of sources, including the Ontario Ministry of Agriculture and Food.

The evaluation of student achievement in courses planned for the basic level of difficulty must recognize the emphasis placed on practical activity in these courses. Approximately 70 per cent of the final mark should be based on the practical component, and 30 per cent on the theoretical component. Students may be asked to demonstrate a particular task, knowing the criteria on which marks will be based. When written tests are given in class, they should be brief and clear and should cover a manageable unit of work. Frequent oral testing is an excellent way of assessing students' progress; administered individually, oral testing can benefit a student who has difficulty with written material. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to general level courses planned under this section will be THL1G for Grade 9 and THL2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe habits in the use of tools, machinery, and protective clothing and equipment and develop positive attitudes towards maintaining a safe worksite;
- learn to select and use hand tools and power equipment on the job;
- acquire an understanding of the skills required for leadership roles;
- acquire and develop knowledge and understanding of plant structures, growth, processes, uses, and classification;
- acquire an understanding of plant terminology and be able to identify and classify common landscape plant material;
- acquire knowledge of soil formation processes, plant nutrient requirements, and fertilizers and develop the skills to maintain healthy, growing lawns and plants;
- acquire the knowledge and skills required to perform various grounds maintenance and/or interior plantscape operations, including common insect, disease, and weed identification and control;
- further develop their ability to communicate about landscape design and maintenance;
- understand and perform basic plant propagation techniques;
- learn the principles of interior and exterior landscape design, be introduced to landscape drafting and surveying, and learn to do various forms of landscape construction;
- acquire an understanding of the field of landscape design and maintenance, including the type of work involved and the effects of the industry on the local economy.

Suggestions for Teachers

Suggestions in the preceding section for basic level courses can be reviewed and adapted to the planning of general level courses.

Courses offered at the general level of difficulty should provide students with opportunities to acquire skills that are essential to landscape design and maintenance. At the same time, students should acquire basic information about the subject and should master the learning skills they will require to extend their studies in this subject.

The additional core content for general level courses, indicated in chart 6.1.3, is in many cases theoretical in nature. As much as possible, this theoretical learning should be closely linked to practical activities and project work. These in turn should support course objectives that reflect the aims outlined in this section.

Students taking courses at the general level of difficulty can be expected to work on more

complex projects and undertake some topics as independent study. Where appropriate, an oral presentation to the class and/or a written report, to reinforce and improve communication skills, should be part of the assignment.

Courses offered for technical literacy should provide a survey of the subject field, with less emphasis on skill development. Units 10 and 11 should be covered extensively, to provide students with an opportunity to carefully prepare a landscape plan. Unit 12 may be used to emphasize the continued survival and appearance of those items planned in units 10 and 11. Students should be encouraged to prepare and mount samples of plant material for use in identifying materials in the landscape.

Evaluation of student progress should be related to the student's success in achieving the course objectives. In horticulture courses at

the general level of difficulty, 60 per cent of the final mark should reflect practical skill development. The remaining 40 per cent of the final mark should reflect the student's understanding of theoretical principles and ability to use horticultural information in work-related activities. Additional comments about

the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Landscape Design and Maintenance Senior Division (Grades 11 and 12)

In recent years there has been an increase in the number of people involved in grounds maintenance, providing everything from simple lawn care to a complete maintenance package. Today's lifestyle seems to encourage this trend. Maintenance packages involve not only caring for lawns but also fertilizing, spraying, and pruning landscape plant material and supplying and installing annuals and bulbs in the appropriate seasons. The need for landscaping and maintenance of commercial and industrial properties increases as businesses move to more extensive properties in suburban areas. In many of these cases, grounds maintenance activities are extended to snow removal in winter.

Courses in landscape design and maintenance in the Senior Division are offered to students who plan to enter employment in the industry after graduation or who are planning post-secondary education in this field. The fundamental skills and knowledge required in landscaping occupations constitute the core content for these courses. Students will learn to identify, select, use, and maintain the hand tools, power tools, and machinery commonly required in landscaping; will acquire knowledge about plant propagation, identification,

protection, and production; and will develop skill in grounds maintenance and landscape construction.

Students taking courses in landscape design and maintenance should not expect to graduate as qualified landscape designers. The emphasis of these courses is on building the basic skills and knowledge that students will need to design, implement, and maintain a landscape. The courses offer a practical approach that will give students an insight into the design process but will place relatively more stress on interpreting landscape plans, constructing the landscape according to plan, and instituting a program of maintenance for the completed project.

Courses in landscape design and maintenance are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 6.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 6.1.4
Core Content for
Landscape Design
and Maintenance
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	cde	cde
1.2 Further training	a	ab
1.3 Economic effects	b	ab
2. Safety		
2.1 Accident prevention and safety rules	ab	ab
2.2 Precautions in the use of hazardous materials	bcd	bcd
2.3 Legislation	abc	bcd
2.6 Working environment	b	b

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
3. Tools and machinery		
3.1 Power units	bcd	cd
3.2 Hand tools	c	c
3.3 Moving equipment	a	ab
3.4 Schedules and manuals	b	b
4. Plant science		
4.1 Plant anatomy		ef
4.2 Plant development		cd
4.3 Plant classification	c	c
4.4 Uses for plants	cd	bc
5. Plant propagation		
5.1 Sexual reproduction	f	f
5.2 Asexual propagation	ab	bef
6. Plant identification		
6.1 Naming	c	
6.2 Definitions	fg	
6.3 Plants for identification using common and/or botanical names	jkm	djln
6.4 Plant recognition techniques	b	b
6.5 Identifying plants for specific uses	cef	cf
6.6 Collection of plants	bh	deghej
7. Plant protection		
7.1 Insects	abef	defg
7.2 Diseases	cde	abcde
7.3 Weeds	bde	cdef
7.4 Other pests	a	a
7.5 Winter and/or storage protection	cd	cd
9. Soils and fertilizers		
9.1 Soil science	cde	deh
9.2 Physical, chemical, and biological features of soil	bdfg	bchk
9.3 Fertilizers	cde	cde
9.5 Soil management	a	acg

Content Units	Core Content for Courses	
	Basic	General
10. Landscape planning and design		
10.1 Residential and/or commercial landscape design	dfg	defg
10.2 Landscape design for public areas	cfh	defgh
10.3 Interior plantscape design	bc	cd
10.4 Landscape drafting and surveying	cdeg	cdefg
11. Landscape construction		
11.1 Estimating and costing	b	bc
11.2 Construction and/or installation of landscape features	bce	cde
11.3 Planting	degh	efgh
12. Grounds maintenance		
12.1 Lawn maintenance	bef	bef
12.2 Planting area maintenance	bd	bd
12.3 Plant maintenance	adf	aef
12.4 Maintenance programming	a	a

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THL3B for Grade 11 and THL4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop good safety habits and attitudes, awareness of the importance of safety procedures in the handling of hazardous materials, and knowledge of safety legislation;
- acquire the knowledge and skills needed to use and maintain tools and equipment (following manuals and schedules) and to comply with the by-laws controlling transportation of tools and equipment on public roads;
- develop the ability to identify (using common and botanical names) and classify plants found in the landscape;
- develop the ability to work productively and co-operatively with others on the job;
- develop the skills of preparing, designing, and drawing a simple landscape plan and perform basic landscape construction operations;
- develop the knowledge and skills required to fertilize and maintain healthy, growing lawns and plants;

- learn to set up and operate a basic grounds maintenance program;
- improve communication skills, to facilitate obtaining and holding employment;

- acquire knowledge of the occupational opportunities in the landscaping field and the possibilities for further training and education.

Suggestions for Teachers

Senior Division courses at the basic level should continue to emphasize the skill and knowledge indicated in the core content of units 2, 3, 11, and 12. Review experiences involving this content should be planned, to provide students with opportunities for success. Students working at this level need to gain confidence in their ability to learn. Satisfactory completion of an assigned task is a good indicator to the student as well as the teacher that the required learning has been accomplished.

The development of the attitudes and interpersonal skills that students will need to succeed in employment should be among the objectives of most group project activities. Estimating and costing activities should be part of students' experiences and related as much as possible to their mathematics courses. These computational abilities are particularly important for those who plan to be self-employed in the landscape maintenance field.

In presenting unit 1, the teacher should provide a brief historical overview of landscape design from both aesthetic and economic points of view. Coverage of units 2 and 3 should include a discussion of accident awareness in the shop and on the job site. The hazards associated with pesticides, fuel, fertilizers, electrical outlets and equipment, and the operation of tools and machinery (especially heavy machinery) should be discussed when each item is introduced and reviewed as necessary.

The topics covered in unit 4 should help students to understand units 6, 9, 10, and 12. Possible topics include photosynthesis, transpiration, respiration, absorption, and other plant functions.

Regular assignments in identifying plant material should be emphasized in unit 6. The expectation in the industry is that graduates will be able to identify, without a key, plant

material commonly used in the industry. Daily exposure to plant material labelled with common names, as well as compilation of various types of plant collections, can do much to facilitate this objective.

In unit 10, the emphasis should be on analysis of the site and of family needs, for purposes of developing the public, private, and service areas of a residential home. Students should learn to use drawing equipment to create simple landscape designs. They should also be able to draw and interpret the symbols used in landscape planning. A basic drafting course can help students to achieve these objectives.

In unit 11, emphasis should be placed on positioning plant and structural materials on a site in accordance with a landscape plan. The importance of using high-quality structural materials should be stressed.

To ensure that landscaping remains attractive, ongoing maintenance is essential. The content of unit 12 is best taught through practical assignments that are linked to other theoretical areas of the course.

Courses offered for technical literacy should provide a survey of the subject field, with less emphasis on skill development. Units 10 and 11 should be covered extensively in order to provide students with an opportunity to prepare a careful landscape plan. Unit 12 may be used to emphasize the continued survival and appearance of those items planned in units 10 and 11. Students should be encouraged to prepare and mount samples of plant material for use in identifying materials in the landscape.

The following are a few of the activities that can be included in a course in landscape design and maintenance:

- Students can visit a landscape designer and discuss the concepts involved in designing a landscape plan.

- Students can develop a site-analysis plan and a family-needs list.
- Students can practise drawing landscape symbols.
- Students can collect, from newspapers and magazines, photographs of well-designed public, private, and service areas of a residence.
- Students can draw alternative area-layout plans.
- Students can wrap and stake newly planted trees and shrubs.
- Using labels, students can identify herbicides as pre-plant, pre-emergence, or post-emergence products.
- Students can mix and apply the spray material required for landscape planting on the school grounds and then clean the equipment they have used. All pesticide handling and storage must be done according to current regulations under the Ontario Pesticides Act. Each classroom should have, for reference, copies of both the Ontario Pesticides Act and the current regulations.
- Students can sample the soil around established landscape plants and trees and send it to a laboratory for analysis. This can be followed by a review and interpretation of the recommendations that are sent back.
- Students can practise pruning a variety of trees and shrubs commonly found in landscaped areas, removing injured limbs, repairing damaged bark, and correcting for shape.

Comments and suggestions about facilities for these courses and about evaluation of student achievement in basic level courses are outlined in the section for Intermediate Division basic level courses in this subject. These suggestions apply as well to Senior Division courses.

Publications and other resource materials for use in landscape design and maintenance courses can be obtained from a variety of sources, including the Ontario Ministry of Agriculture and Food.

Suggestions for teaching interior plantscaping, outlined in the section for general level courses that follows, may be adapted for basic level courses.

Where it is possible, students in Senior Division courses should have opportunities to try out their classroom learning on the job, through work experience or co-operative education. Student reports and class discussions are important features of these work experiences. Where a particular landscaping or maintenance need is identified in the community, the job may be planned and undertaken as a class activity.

General Level

Course codes assigned to general level courses planned under this section will be THL3G for Grade 11 and THL4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- further develop safe work habits and attitudes and acquire knowledge of safety legislation and the procedures for handling hazardous chemicals and materials;
- maintain tools and equipment using service manuals and specified schedules, perform necessary repairs, and acquire knowledge

and understanding of legislation governing transportation of materials, tools, and equipment on public thoroughfares;

- carry out preliminary investigations for, design, and draw a complete landscape plan for a given situation and perform the operations necessary to complete the installation of the design;

- acquire and develop leadership skills and a co-operative attitude towards others in the work environment;
- acquire knowledge of soil management and the skills required to manage and maintain soil in a healthy, friable form;
- develop knowledge and understanding of plant terminology and nomenclature and be able to identify, using botanical and common names, a significant number of landscape plants;
- plan and implement a complete program for maintenance of grounds and/or of an interior plantscape;
- develop work-related skills such as following written instructions, identifying and listing procedures, and preparing sales arguments for significant features of a landscape design;
- explore the occupational and educational opportunities in the landscape design and maintenance industry and develop an overview of the economic and aesthetic contributions of the industry.

Suggestions for Teachers

Courses offered at the general level of difficulty should provide students with opportunities to acquire trade skills that are basic to landscape design and maintenance. At the same time, students should acquire the fundamental theoretical and practical knowledge of the subject and master the learning skills they will require to continue their studies in this subject field.

Suggestions and comments outlined in the previous section for basic level courses can be reviewed and adapted for general level courses. Projects in general level courses should include more theoretical work than similar projects at the basic level. The theoretical work will include solving problems, understanding elements of design, and relating practice and procedures to scientific and commercial principles.

Topics from the core content should be studied in greater depth and breadth each time they are structured into a course, throughout the program. This approach continues into college programs for students who continue their studies to become technicians or technologists.

The topics of unit 10.3, on interior plantscaping, provide opportunities for extensive project work. Where a community wants it, interior plantscaping can be the major theme for the course. Interior plantscaping is a fast-growing field that includes many kinds of activities, from working with the architect on the design of the planting areas and planning lighting, watering, and humidity control systems, through designing, supplying, and installing the actual plant material and developing maintenance packages.

The following are a few of the activities that can be included in a course in landscape design and maintenance:

- Students can design and construct landscape models using materials at hand.
- Students can design and construct interior plantscapes in areas within the school or at other schools within the board.
- In co-operation with local landscape firms, visits can be made to landscape projects at various stages of design and construction.
- Students involved in interior plantscape projects can make visits to shopping malls, buildings, and offices where extensive interior landscaping has taken place.
- Visits can be made to greenhouses specializing in growing and importing tropical plants for interior planting.
- Students can be encouraged to observe and report on external and internal uses of plants in areas they visit in the course of normal activities and while on vacation.

Evaluation of student achievement should be based on assessments of the student's progress in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should be based on assessments of the student's progress in developing and demonstrating practical skills. The remaining 40 per cent of the final mark should reflect the student's progress in learning theoretical principles and horticultural information and using this knowledge to solve problems related to the workplace. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Nursery Production

Intermediate Division

(Grades 9 and 10)

Nursery production involves growing and caring for ornamental plants in wholesale and retail nurseries. Students enrolling in these courses will be introduced to skills and knowledge required in horticultural nursery production – in particular, production of nursery stock used in outdoor rather than indoor landscaping.

The large-scale production of ornamental plants for landscaping takes place in a nursery. From a horticultural viewpoint, nurseries vary greatly, depending on the crops to be grown and the climatic conditions of the nursery location. Courses based on this subject will be concerned only with the production of stock suitable for the outdoors in the plant hardiness zones of Ontario. They will not include the production of tropical plants, normally used for indoor landscaping.

Courses in nursery production are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 6.1.5 identifies the core

content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in nursery production may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. Courses that are offered entirely in school may therefore range from one-quarter credit to two credits in any one year. Co-operative education components (described on pages 13 and 14 of *Technological Studies, Part A: Policy for Program Planning*) may be planned to support the in-school course work and to provide additional credits in this subject.

If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that core items be chosen to increase practical skills that may eventually lead to employment.

Chart 6.1.5
Core Content for
Nursery Production
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	a	ab
1.3 Economic effects	c	c
2. Safety		
2.1 Accident prevention and safety rules	a	a
2.2 Precautions in the use of hazardous materials	a	a
2.3 Legislation		a
2.4 Tools and equipment	a	a
2.5 Accidents	a	a
2.6 Working environment	a	a
3. Tools and machinery		
3.1 Power units	aef	abef
3.2 Hand tools	abde	abde
3.4 Schedules and manuals	a	a

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
4. Plant science		
4.1 Plant anatomy	bd	bcd
4.2 Plant development	a	ab
4.3 Plant classification	a	abc
4.4 Uses for plants	a	a
5. Plant propagation		
5.1 Sexual reproduction	ad	abcd
5.2 Asexual propagation	ab	abc
6. Plant identification		
6.1 Naming	ab	abc
6.2 Definitions	abc	abcfg
6.3 Plants for identification using common and/or botanical names	i	ij
6.4 Plant recognition techniques	a	a
6.5 Identifying plants for specific uses	be	ab
6.6 Collection of plants		abd
7. Plant protection		
7.1 Insects	cd	abc
7.2 Diseases		ab
7.3 Weeds	ac	ab
7.5 Winter and/or storage protection	a	a
8. Plant culture and production		
8.4 Nursery crops	a	a
9. Soils and fertilizers		
9.1 Soil science	abc	abc
9.2 Physical, chemical, and biological features of soil	abfg	abcf
9.3 Fertilizers	ab	ab
9.5 Soil management	abd	abc
11. Landscape construction		
11.3 Planting	adg	adegh

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
12. Grounds maintenance		
12.3 Plant maintenance	b	b
13. Nursery operations		
13.1 Types, designs, layouts	a	a
13.2 Location	a	a
13.3 Planting/digging operations – field-grown stock	a	ab
13.4 Production of container-grown stock	a	a
13.5 Storage and display facilities	a	a
15. Nursery and greenhouse sanitation		
15.1 Sanitation	a	a

See “Course Content for the Horticulture Grouping”, beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THN1B for Grade 9 and THN2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire a positive attitude towards safe habits in the use of tools, machinery, and protective clothing and equipment;
- develop skills in the selection and appropriate use of hand tools, power tools, and equipment for nursery production activities;
- develop the communication skills that are required to work effectively in the nursery industry;
- develop a co-operative attitude towards peers and supervisors;
- acquire insights into soil science and soil management, including the physical features of soil, the properties of fertilizers, and the nutrient requirements of plants;
- acquire a basic understanding of the process used in naming plants and learn to identify a number of plants commonly grown in the nursery industry;
- acquire basic knowledge of plant structures, processes, growth, and classification and perform seeding and transplanting operations;
- learn the cultural practices for a number of common nursery plants;
- investigate various types of nurseries and identify factors that influence the choice of location;
- be introduced to the horticultural occupation of nursery production, learning the nature of the work involved and the importance of the industry to the local economy.

Suggestions for Teachers

Basic level courses should be exploratory in nature, providing students with an overview of the nursery production industry and introducing them to the skills and knowledge required for work activities in the industry.

The course should involve a high proportion of practical activities, allowing students to learn the theoretical component of each core topic through application. Initially the activities should accommodate extensive teacher-student interaction. As students progress, they should be encouraged to proceed with assigned tasks as independently as they can.

In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to learn. Teachers can foster confidence by ensuring that the student has successful experiences. Ensuring success is a challenge to the teacher's powers of observation, imagination, and patience. Wherever possible, learning should be related to the student's mathematical and language studies, in order to reinforce the importance of these subjects in the field of nursery production.

The content of unit 1 should provide students with an overview of working conditions and economic aspects of the industry. A brief historical outline and discussions of educational and employment opportunities in the nursery field can also be included. The most effective way to present the material in this unit is by discussing it whenever it is relevant to student questions, class discussion, or other course content.

The treatment of core content in units 2 and 3 should include a discussion of accident awareness both in the shop and on the job site. The hazards associated with pesticides, fuel, fertilizers, electrical outlets and equipment, and operation of tools and machinery (especially heavy machinery) should be discussed when each item is introduced and should be reviewed as necessary. Safety in the use of hand tools and knives in particular should be stressed. It is imperative that tools be kept sharp and in the best repair; broken or dull tools lead to accidents.

The theoretical content of units 4, 6, 7, and 9 should be structured around the more practical activities associated with units 5, 8, 12, and 13.

The learning activities related to unit 5 involve considerable hands-on work as students learn how to propagate many of the more common plants from cuttings and by grafting. As these propagation processes are more rapid than seed production, students can see the results of their work more quickly.

Identification of plant materials commonly grown in nurseries should begin early in the course and continue as a regular activity. The expectation in the industry is that graduates will be able to identify plant material commonly used in the industry without resorting to a key. Daily exposure to plant material labelled with common names can do much to facilitate this objective.

Trips to local nurseries, sod growers, orchards, seed houses, reforestation areas, and garden centres can be used to reinforce the classroom experiences. These field trips provide product knowledge and give the student personal glimpses of particular sectors of the trade. This exposure to a variety of settings permits the student to make comparisons and to form ideas about where he or she might fit in.

The evaluation of student progress in these basic level courses should be heavily weighted towards the student's achievement in practical work. Approximately 70 per cent of the term mark should be based on the practical component and 30 per cent on the theoretical component. Written tests should be short and should cover a limited number of topics. Frequent oral testing is often an excellent way of assessing students' progress. Additional comments about the evaluation of student achievement are outlined in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to basic level courses planned under this section will be THN1G for Grade 9 and THN2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire good safety habits and a positive attitude towards safety in the use of tools, equipment, machinery, and protective clothing and devices;
- learn to select and use hand and power tools and equipment;
- develop language and communication skills applicable to work in the nursery industry;
- acquire an understanding of the skills required for leadership;
- learn about soil formation and the physical features of soil, plant nutrient requirements and fertilizers, and the importance of managing soil correctly;
- acquire practical knowledge of plant terminology and classification, and the skill of identifying plants that are commonly available in the nursery industry;
- acquire practical knowledge and understanding of plant structures, growth, processes, and classification and carry out essential seeding and transplanting operations;
- demonstrate the ability to cultivate a number of common nursery plants;
- gain insights into the layout, choice of site, and storage and display facilities of various types of nurseries;
- acquire an overview of nursery production as a field in the horticulture industry, an understanding of the type of work involved, and some insight into the significance of the industry to the local economy.

Suggestions for Teachers

Teachers who are planning courses in this subject at the general level of difficulty should refer to suggestions for teachers in the preceding section for basic level courses. The skills and knowledge identified for many of the work activities in nursery production are the same for the two levels of difficulty. Students taking their courses at the general level of difficulty, however, may be expected to develop these skills in less time.

General level programs should involve more theoretical material from units 4, 6, 7, and 9, and students should be expected to work on more complex projects. The theoretical aspect should not become the dominant part of the program but should develop naturally around the practical component of the course. The additional core content for general level courses is identified in chart 6.1.5.

In dealing with the content of unit 6, teachers working with students at the general level should encourage them to learn both the botanical and the common names of nursery stock.

General level students who are considering continuing their education and training in the horticulture field can benefit from discussions with invited guests who work at various occupational levels in the nursery production industry. Such visitors can provide information about nursery operations (unit 13) that is supplementary to information obtained from visits to local nurseries.

Where time permits, students should be encouraged to undertake independent study of some topics. Preparation of brief reports or presentations on these topics is an important component of this learning strategy. Where classes combine groups of students working at different levels of difficulty, independent study can be an important teaching strategy. Teachers planning such courses should refer to the comments on bi-level and bi-grade classes in the introduction to this module.

Evaluation of student progress should be related to the student's success in achieving the course objectives. In horticulture courses at

the general level of difficulty, 60 per cent of the final mark should reflect practical skill development. The remaining 40 per cent of the final mark should reflect the student's understanding of theoretical principles and ability to use horticultural information in work-related activities. Additional comments about

the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Nursery Production

Senior Division

(Grades 11 and 12)

Courses in nursery production in the Senior Division acquaint students with the theoretical procedures and the practical skills required to grow and care for ornamental plants in wholesale and retail nursery operations. Students will be involved in the production of nursery stock from propagation and lining-out, through cultivation and care, to digging and sales. There will be discussions of field-grown versus container-grown stock, chemical versus mechanical weed control, soil management and improvement, and many other aspects of the nursery business.

Courses based on this subject can prepare students for entrance into occupations in the nursery production industry or for apprenticeships as horticulturists. Students may also continue their training in postsecondary programs that prepare graduates for a variety

of occupations in the horticulture industry. Students proceeding to postsecondary studies should be aware that success in these programs requires good preparation in mathematics, science, and language.

Courses in nursery production are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 6.1.6 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 6.1.6
Core Content for
Nursery Production
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	cd	cd
1.2 Further training	a	ab
1.3 Economic effects	b	ab
2. Safety		
2.1 Accident prevention and safety rules	ab	ab
2.2 Precautions in the use of hazardous materials	bcd	bcd
2.3 Legislation	abc	bcd
2.6 Working environment	b	b
3. Tools and machinery		
3.1 Power units	bcd	cd
3.2 Hand tools	c	c
3.3 Moving equipment	a	ab
3.4 Schedules and manuals	b	b
4. Plant science		
4.1 Plant anatomy	ce	ef
4.2 Plant development		cd

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
4.3 Plant classification	b	d
4.4 Uses for plants	cd	cd
5. Plant propagation		
5.1 Sexual reproduction	bfi	fgi
5.2 Asexual propagation	cefi	defghi
6. Plant identification		
6.1 Naming	c	
6.2 Definitions	fg	
6.3 Plants for identification using common and/or botanical names	j	kl
6.4 Plant recognition techniques	b	b
6.5 Identifying plants for specific uses	af	ef
6.6 Collection of plants	afh	cdeh
7. Plant protection		
7.1 Insects	adef	defg
7.2 Diseases	cde	abcde
7.3 Weeds	bde	cdef
7.4 Other pests	a	a
7.5 Winter and/or storage protection	bc	bc
8. Plant culture and production		
8.4 Nursery crops	b	b
9. Soils and fertilizers		
9.1 Soil science	def	defgh
9.2 Physical, chemical, and biological features of soil	cdehl	deg hkl
9.3 Fertilizers	cde	cdef
9.5 Soil management	ceg	defg
12. Grounds maintenance		
12.3 Plant maintenance	acd	acd
12.4 Maintenance programming	a	a
13. Nursery operations		
13.1 Types, designs, layouts	b	bc
13.2 Location	b	bc

Content Units	Core Content for Courses	
	Basic	General
13.3 Planting/digging operations – field-grown stock	bd	cde
13.4 Production of container-grown stock	b	bc
13.5 Storage and display facilities	bc	bc
15. Nursery and greenhouse sanitation		
15.1 Sanitation	bd	bd
15.2 Problem areas	ac	ac
17. Merchandising and marketing		
17.1 Cost analysis/pricing	bcf	cdef
17.2 Marketing and advertising	a	ab
17.3 Merchandising and display	acde	acdef

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THN3B for Grade 11 and THN4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a commitment to the use of proper safety procedures, the knowledge and skills necessary to use hazardous chemicals and materials safely in nursery production, and basic knowledge of safety legislation;
- acquire the practical knowledge and skills required to perform basic service, repair, and maintenance operations (following manuals and service schedules) on a variety of tools and equipment used in nursery production;
- improve communication skills, to increase chances of obtaining and retaining employment;
- acquire the skills needed to ensure co-operation among nursery personnel;
- become knowledgeable about local soil types, chemical and biological features of soil, tests for nutrients, fertilizer application, soil erosion control, and conservation;
- develop the skills required to identify, by botanical and common names, plants grown in the nursery industry in the province, and make collections, in whatever form is appropriate, to aid in identification;
- develop an understanding of the uses of plants and the ability to propagate plants asexually;
- develop the theoretical knowledge and practical skills required to produce nursery crops (both in the field and in containers), including knowledge of nursery sanitation and procedures for winter and storage protection;
- acquire an understanding of cost analysis and the objectives of marketing and advertising and learn to set up displays of nursery-related items;
- acquire knowledge of the careers available in the industry, the possibilities for further training and education, and the impact of the industry on the provincial economy.

Suggestions for Teachers

The planning of basic level courses in the Senior Division must be structured around learning objectives that reflect the aims and core content for this section. The teaching strategies should involve the student in a sequence of practical learning experiences and projects that both reinforce what has been learned and add new learning. The learning experiences can be linked to major themes such as the garden centre (as a merchandising outlet), container-grown stock, and nursery grounds maintenance. The theme approach helps students to relate and organize the many separate skills and bits of theory and practical knowledge they acquire during the course. More than one theme can be developed at a time.

The core content for these courses builds on the core content introduced in Grades 9 and 10. In planning Senior Division courses, teachers should review the section for basic level courses in nursery production, Intermediate Division, and adapt the suggestions for teachers where appropriate.

Topics from unit 7 ("Plant protection"), such as common insects and diseases, as well as topics in other units, can be usefully augmented by practical advice from local representatives of the Ministry of Agriculture and Food. Students should be encouraged to explore and become familiar with nursery trade journals, horticultural magazines, promotional materials, bulletins, and other trade-related resources, all of which should be made accessible to them.

The culture of specific types of nursery stock is dealt with in unit 8. Visits to nurseries specializing in plant propagation and to agricultural colleges and universities conducting research on plant culture can increase students' interest in this unit.

Unit 13 deals with specific nursery operations not dealt with in other units. As these form an important part of nursery operations, they should be emphasized in the students' practical work activities.

Students should be made aware of the changing demands of the consumer market and of the special handling techniques for meeting some of these new demands in Ontario. Container-grown stock, for example, is now in demand during the summer months as well as at the more traditional planting times of spring and fall. The demand for larger nursery stock, particularly shade and specimen trees, has led to the establishment of nursery operations that specialize in this kind of plant.

In all basic level courses, program modifications must be considered to meet the needs of students who are behaviourally, physically, and/or intellectually exceptional. Sometimes such adjustments can be made rather simply by decreasing written assignments, increasing practical work, rearranging work areas, providing special assignments, obtaining appropriate aids, and so on. Exceptional arrangements might be made within the local nursery community to meet a particular need. Recognizing and meeting exceptional needs will challenge the perception and imagination of the teacher.

The ability to sell is increasingly required of employees in the nursery trades. The operation of a small nursery on school property can help students to develop this ability. Nursery stock may be produced for use around the school, for retail sales to staff and students, and for wholesale to other schools within the board. Alternatively, students may want to set up and operate a more sophisticated in-school garden centre that provides a retail outlet for their finished products. A wholesale function can be used to move surplus retail materials. When a business studies course in retail merchandising can be included as a component of a school-related nursery production or horticulture package, skills learned in that course, including displaying, record keeping, and dealing with customers, can be practised in the garden centre.

Work experience and/or co-operative education programs should be a component of all Senior

Division courses in nursery production. One of the best ways to show students the value of what they have learned is to let them apply it in the local nursery. Many different kinds of

work are usually in progress in a nursery, and the operator may be willing to have some of these tasks performed by a student.

General Level

Course codes assigned to general level courses planned under this section will be THN3G for Grade 11 and THN4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe work habits, the ability to recognize safety hazards in the workplace, knowledge of safety legislation, and the ability to work safely with hazardous chemicals and materials in nursery production;
- set up a program for maintaining tools and equipment and learn to perform simple repairs to the equipment;
- follow oral and written instructions for work procedures and prepare outlines of task procedures that can be followed by others;
- acquire the skills of working on group tasks both co-operatively and in a leadership role;
- acquire knowledge of soil classification, soil types, soil testing, chemical and biological components of soil, appropriate nutrient application for plants, and correct soil management practices;
- develop knowledge and understanding of plant nomenclature and terminology, make collections to aid in plant identification, and learn to identify (by their botanical and common names) plants grown in the nursery industry;
- become familiar with the various forms of plant structure, growth, processes, and classification and with techniques for asexual plant propagation;
- set up a pricing structure for nursery merchandise, understand the components of effective marketing (product selection, advertising, and sales), and organize and operate a sales area within the school;
- follow the operational practices of a nursery (including maintenance, pruning, cultivation, staking, planting, digging, potting, sanitation, protection, grading, and shipping) for a wide range of nursery plants;
- explore the possibilities for further education and training in the industry and become aware of the importance of the industry to the provincial economy.

Suggestions for Teachers

Teachers planning courses at the general level should refer to the suggestions for teachers in the preceding section for basic level courses. Comments about structuring courses, using themes, modifying courses for exceptional students, developing marketing skill and knowledge, and giving students work experience can be adapted to the planning of general level courses.

Students taking a course based on this section with the goal of continuing in a postsecondary diploma or degree program should be given a comprehensive overview of this subject field, with less emphasis on the development

of particular skills. These students should be made aware that good achievement in Grade 12 mathematics, English, and science is essential for success in a postsecondary program.

An understanding of soil and fertilizer is important to growers. Unit 9 will help students understand that soil is not a renewable resource and must be carefully managed. Students at this level of difficulty should be expected to write short scientific reports on soil-testing experiments.

A visit to a floral display in a local park can be arranged to allow students to see how a professional gardener uses a variety of plants to create a certain effect. Students can be given the assignment of identifying the various plants in a particular bed within the garden and arriving at an approximate cost of producing the display. Trips like these can be interesting for students and can give them some ideas about how the products of nursery production may be used. Students should also be given the opportunity to visit a local nursery several times during the year to see how the plants are dealt with from propagation to final product. The teacher may wish to organize the class into groups of two or three and send them out to different nurseries. The students can be assigned the task of writing a report or giving an oral presentation on their observations.

Students should be made aware of the importance of the nursery production industry to the economy and should be given the opportunity to read or hear about the latest techniques in use by large commercial establishments. A visit by a person in this field or readings from recent issues of trade journals will help students acquire some insight into the latest developments.

Unit 17, "Merchandising and marketing", can be very interesting to students studying at the general level of difficulty. Some may eventually become involved in management

work or own their own businesses. In the course of analysing costs and pricing plants, students will gain some insight into the commercial aspect of the industry. The problems involved in selling and marketing the finished product should be discussed in detail, to show students that efficient handling of these matters is essential for success in the nursery business. Students should be made aware that there is much more to the nursery production business than growing plants.

Student progress should be evaluated according to course objectives. In courses for students with postsecondary education goals, assessment of progress in practical skills should include problem-solving exercises. Although understanding of theoretical principles is important in general level courses, it should not receive the primary emphasis in evaluation of student achievement; instead, 60 per cent of the final mark should reflect practical skill development. Additional comments about the evaluation of student achievement are outlined in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Greenhouse Production

Intermediate Division

(Grades 9 and 10)

Greenhouse production is an interesting phase of horticulture that can be a career or an avocation. Courses in this subject introduce students to the operation of this expanding division of the horticulture industry and to the employment opportunities it offers. Students in the Intermediate Division will have the opportunity to propagate plants, learn to care for them under greenhouse conditions, study plant biology, and gain some insight into the economic factors in greenhouse production.

Students take courses in this subject for a variety of reasons. For some it is the first step towards a career in greenhouse production, while for others it is an introduction to the rewarding hobby of growing plants.

Courses in greenhouse production are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 6.1.7 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in greenhouse production may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. Courses that are offered entirely in school may therefore range from one-quarter credit to two credits in any one year. Co-operative education components (described on pages 13 and 14 of *Technological Studies, Part A: Policy for Program Planning*) may be planned to support the in-school course work and to provide additional credits in this subject.

If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that core items be chosen to increase practical skills that may eventually lead to employment.

Chart 6.1.7
Core Content for
Greenhouse
Production
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	a	ab
1.3 Economic effects	c	c
2. Safety		
2.1 Accident prevention and safety rules	a	a
2.2 Precautions in the use of hazardous materials	a	a
2.3 Legislation		a
2.4 Tools and equipment	a	a
2.5 Accidents	a	a
2.6 Working environment	a	a
3. Tools and machinery		
3.1 Power units	aef	abef
3.2 Hand tools	abde	abde
3.4 Schedules and manuals	a	a

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
4. Plant science		
4.1 Plant anatomy	bde	bcd
4.2 Plant development	a	ab
4.3 Plant classification	a	ac
4.4 Uses for plants	a	ad
5. Plant propagation		
5.1 Sexual reproduction	adi	abcdi
5.2 Asexual propagation	a	ab
6. Plant identification		
6.1 Naming	ab	abc
6.2 Definitions	ade	ade
6.3 Plants for identification using common and/or botanical names	ac	ace
6.4 Plant recognition techniques	a	a
6.5 Identifying plants for specific uses	cf	cf
7. Plant protection		
7.1 Insects	cd	abc
7.2 Diseases	ab	
7.3 Weeds	ac	ab
8. Plant culture and production		
8.1 Greenhouse crops	ac	ace
9. Soils and fertilizers		
9.2 Physical, chemical, and biological features of soil	abf	abcdf
9.3 Fertilizers	ab	ab
9.4 Soil mixtures	ab	ab
14. Greenhouse structures, systems, and construction		
14.1 Factors affecting site selection		a
14.2 Types and layouts	ab	ab
14.3 Construction materials and designs	a	a
14.4 System designs	c	ac

Content Units	Core Content for Courses	
	Basic	General
15. Nursery and greenhouse sanitation		
15.1 Sanitation	a	a
17. Merchandising and marketing		
17.1 Cost analysis/pricing	a	ab

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THG1B for Grade 9 and THG2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire the ability to perform tasks safely and efficiently using hand and power tools;
- develop general knowledge about how the various hand and power tools are used and learn to select the correct tool for a given task;
- improve reading, writing, and speaking skills and learn to use correctly some of the basic terminology involved in greenhouse production;
- develop a co-operative attitude towards peers and supervisors;
- acquire basic knowledge of soils and fertilizers and learn to prepare a potting mixture suitable for most greenhouse crops;
- develop the ability to recognize common pests and the types of damage they cause to greenhouse plants;
- acquire basic knowledge of plant structure, growth, and classification and learn propagation and transplanting techniques;
- learn how plants are named and develop the ability to identify some of the more common ones grown in a greenhouse;
- acquire an understanding of the basic financing of greenhouse production;
- acquire knowledge of the various types of greenhouses, their general construction, and the types of systems they use;
- learn about the career opportunities in the greenhouse production industry.

Suggestions for Teachers

In courses at the basic level, it is important for students to be involved in a wide range of activities that hold their interest and give them a sense of satisfaction. Greenhouse production is one area in which physically handicapped young people can function fairly efficiently. Many of the operations in plant propagation and potting require very little physical movement.

A greenhouse that is run efficiently is well organized, with soils properly contained and tools and equipment neatly stored in a designated location. A specified set of procedures

for cleaning up the greenhouse at the end of the period can maintain this efficiency. It is important for students to develop good house-keeping skills, and daily practice is the way to ensure that they do. Neatness in the greenhouse also reduces the risk of accidents.

Courses planned for students studying at the basic level of difficulty should emphasize the correspondence between students' academic and technical studies. Wherever possible, the teachers involved with the students' horticultural and academic programs should discuss

ways in which the various disciplines can be integrated. A student who has the opportunity to apply a theoretical principle has a much better chance of comprehending its significance and of being able to apply it in the future.

In courses taught at this level, complicated topics, projects, and problems involving greenhouse production management should be avoided. The course should emphasize basic preparation and maintenance – plant growth, identification, propagation, protection, and culture, and soils, fertilizers, and environment control. The practical skills indicated in units 5, 8, 9, and 17 should be thoroughly taught. Coverage of unit 7 should be limited to the more common insects and diseases – the damage they do and how they are controlled. Weeds should be identified, and weed problems in the greenhouse, and their solutions, should be discussed.

Besides providing opportunities for students to acquire skills that are applicable to greenhouse production, courses at this level of difficulty must provide students with the subject knowledge and mastery of learning skills they will require to extend their studies in the horticulture field.

The following are the kinds of activities that can be included in a greenhouse production course:

- Students can prepare displays of plant pests and diseases.
- Students can set up charts showing pests and diseases and their control.

- Students can prepare posters on chemical safety.
- Using various materials, students can prepare appropriate planting media for benches, containers, and seed flats.
- Students can plant various seeds and determine the amount of time needed for germination.
- Students can learn the common names of specimens on a plant stand.
- Students can experiment with various types of cuttings in various rooting media and record the extent of development at various intervals after planting.

The evaluation of student achievement in courses planned for the basic level of difficulty must recognize the emphasis placed on practical activity in these courses. Approximately 70 per cent of the final mark should be based on the practical component, and 30 per cent on the theoretical component. Students may be asked to demonstrate a particular task, knowing the criteria on which marks will be based. When written tests are given in class, they should be brief and clear and should cover a manageable unit of work. Frequent oral testing is an excellent way of assessing students' progress; administered individually, oral testing can benefit a student who has difficulty with written material. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to general level courses planned under this section will be THG1G for Grade 9 and THG2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire a positive attitude towards safe procedures in the use of hand and power tools,

as well as the wearing of protective clothing and safety equipment;

- learn to use various tools and machines in greenhouse production and to select the appropriate one for a particular task;

- develop the ability to communicate efficiently on horticultural topics using the terminology associated with greenhouse production;
- work co-operatively with other members of the class and develop leadership qualities;
- acquire knowledge of the physical, chemical, and biological features of soil and their effects on plant growth, and apply this knowledge in the preparation of an all-purpose potting mixture;
- acquire knowledge of plant terminology and classification and learn to identify many of the plants produced by the greenhouse industry;
- acquire knowledge of basic botany and the ability to perform seeding and transplanting operations;
- learn to identify the more common insects found in a greenhouse, to classify them, and to recognize the types of damage they create;
- acquire knowledge of the types of weeds found in a greenhouse and means of controlling their growth;
- develop the ability to produce a range of greenhouse flowering, green, bedding, and vegetable plants;
- acquire knowledge of the major factors that influence the pricing structure of greenhouse crops;
- acquire knowledge of greenhouse construction, including such factors as site selection, construction materials, types of systems necessary to operate a greenhouse, and types of greenhouses;
- acquire an overview of greenhouse production as a field of the horticultural industry, an understanding of the types of work involved, and some insight into the significance of the industry to the local economy.

Suggestions for Teachers

Teachers planning courses for students at the general level of difficulty should review the suggestions outlined in the basic level program, for in many cases the practical aspects of the subject are the same. Though at this level of difficulty the content is dealt with more theoretically than at the basic level, the practical work should still be considered the major component of the course.

Students studying at the general level of difficulty in the Intermediate Division are often very interested in exploring career opportunities. In unit 1 ("Introduction and opportunities"), students should be provided with an overview of the greenhouse production industry. A talk by a person from the industry, in conjunction with a visit to a commercial greenhouse, provides an excellent opportunity for students to learn more about the industry and helps them to make decisions concerning enrolment in this area of study in the Senior Division.

Units 2 and 3 involve safety and the use of tools and machinery. Both of these topics should be thoroughly taught to young people working in and around a greenhouse. Students must understand how to use tools and machinery safely, and how to make minor repairs

to them, before they undertake the other practical activities of the course.

Unit 4 should be presented in a way that provides students with an understanding of the structure, function, and processes of plants. The work on plant propagation (unit 5) requires an understanding of the topics discussed in unit 4.

Regardless of whether a young person wishes to pursue a career in greenhouse production, knowledge of the names of plants grown in greenhouses is worthwhile. Students studying at the general level of difficulty should be expected to learn both the common and the botanical names of several common plants.

In unit 8 ("Plant culture and production"), the central concepts of practical plant production are discussed. Some of these topics can be taught co-operatively with the science teacher. The theoretical component of such topics as pH requirements, soil temperatures, nutrition, and seed germination can be dealt with in a science laboratory, while the effects of these conditions on plant growth can be

demonstrated in the greenhouse. Students should be expected to write moderately detailed reports on their observations. English teachers can provide assistance with, and evaluation of, the writing of these reports.

In unit 14 ("Greenhouse structures, systems, and construction"), students should be presented with a general overview of greenhouse construction and maintenance, but details about the design of actual structures and the maintenance of operating systems should be saved for Senior Division. Although Grade 9 and 10 courses in greenhouse production are intended primarily to introduce students to the proper production of greenhouse crops, students should also be made aware of some of the financial considerations involved in operating a greenhouse. This topic, too, will be dealt with in greater detail in Senior Division courses.

Evaluation of student progress should be related to the student's success in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should reflect practical skill development. The remaining 40 per cent of the final mark should reflect the student's understanding of theoretical principles and ability to use horticultural information in work-related activities. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Greenhouse Production

Senior Division

(Grades 11 and 12)

Courses in greenhouse production in the Senior Division acquaint students with the procedures and practical skills that are required in the production of a wide range of greenhouse crops. Students are involved in most aspects of greenhouse production, ranging from plant propagation, protection, production, soils, and fertilization to merchandising and marketing of the finished product. The maintenance and design of various types of greenhouses are also included in these courses.

Students enrolled in a greenhouse production program should not expect to graduate as full-fledged greenhouse operators. What they should have at graduation are the basic practical skills used in the business, the life skills associated with horticultural activities, and awareness of the opportunities for employment and further training in the industry.

The sections that follow outline the requirements for planning courses in greenhouse production at the basic and general levels of difficulty. At the basic level, skills and knowledge appropriate to students with exceptional needs can, and should, be stressed.

General level courses should focus on the scientific aspects of the horticultural activities to a greater degree than basic level courses do. Throughout the program, core and optional topics should be studied at greater depth and breadth each time they are structured into a course.

Students considering postsecondary education in this field should be aware of the need for a strong background in other subjects. Good achievement in Grade 12 mathematics, English, and science is essential for success in a postsecondary program.

Courses in greenhouse production are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 6.1.8 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 6.1.8
Core Content for
Greenhouse
Production
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	cd	cd
1.2 Further training	a	ab
1.3 Economic effects	b	ab
2. Safety		
2.1 Accident prevention and safety rules	ab	ab
2.2 Precautions in the use of hazardous materials	bcd	bcd
2.3 Legislation	abc	bcd
2.6 Working environment	b	b
3. Tools and machinery		
3.1 Power units	bcd	cd
3.2 Hand tools	c	c
3.4 Schedules and manuals	b	b

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
4. Plant science		
4.1 Plant anatomy	cf	ef
4.2 Plant development	e	cde
4.3 Plant classification	c	bd
4.4 Uses for plants	cd	bc
5. Plant propagation		
5.1 Sexual reproduction	bcf	efgh
5.2 Asexual propagation	bei	cegi
6. Plant identification		
6.1 Naming	c	
6.3 Plants for identification using common and/or botanical names	bde	bdfg
6.4 Plant recognition techniques	b	b
6.6 Collection of plants	ai	aik
7. Plant protection		
7.1 Insects	abef	defg
7.2 Diseases	cde	abcde
7.3 Weeds	bde	cdef
7.4 Other pests	a	a
8. Plant culture and production		
8.1 Greenhouse crops	ef	bdf
9. Soils and fertilizers		
9.1 Soil science	ac	acd
9.2 Physical, chemical, and biological features of soil	cdghk	ehkl
9.3 Fertilizers	cdef	cdef
9.4 Soil mixtures	cde	cde
12. Grounds maintenance		
12.4 Maintenance programming	a	a
14. Greenhouse structures, systems, and construction		
14.1 Factors affecting site selection	c	b
14.2 Types and layouts	c	c

Content Units	Core Content for Courses	
	Basic	General
14.3 Construction materials and designs	bc	bc
14.4 System designs	eg	bdefg
15. Nursery and greenhouse sanitation		
15.1 Sanitation	bcd	bcd
15.2 Problem areas	bc	bc
17. Merchandising and marketing		
17.1 Cost analysis/pricing	bcd	cdef
17.2 Marketing and advertising	a	ab
17.3 Merchandising and display	acde	abcdef

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THG3B for Grade 11 and THG4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits and attitudes and acquire knowledge of safety legislation and the procedures for handling hazardous chemicals and materials;
- develop the ability to read maintenance manuals and perform maintenance operations and minor repairs on tools and equipment;
- further develop the communication skills needed in the greenhouse industry;
- acquire the ability to work with their peers and supervisor efficiently and co-operatively;
- learn the basic principles of soil science and how to mix and apply fertilizers and prepare potting mixtures for specific crops;
- learn to identify, by their botanical and common names, plants grown in the greenhouse industry;
- further explore plant anatomy, development, classifications, and uses and learn to propagate plants asexually;
- prepare a maintenance schedule for a greenhouse operation;
- acquire general knowledge of cost factors, marketing techniques, and advertising concepts and set up a display to promote goods produced in the school greenhouse;
- become more knowledgeable about plant pests and acquire the skills necessary to prevent and/or control pest problems;
- learn more about the production of greenhouse crops and set up a simple record-keeping system;
- explore factors related to greenhouse construction, such as site selection, types of materials, and interior layouts, and be able to perform basic maintenance on the essential systems;
- acquire knowledge of the careers available in the greenhouse production industry and the availability of further training and education.

Suggestions for Teachers

Senior Division courses in greenhouse production at the basic level should build on the introductory skills and knowledge that students may have acquired in horticulture courses in the Intermediate Division. Practical assignments at the beginning of Senior Division courses should provide opportunities for students to review earlier learning and to perceive how experiences planned for their Senior Division course will build on what they have learned. Projects and practical work experiences should account for at least 70 per cent of the course time.

The core content of unit 1 should provide students with some understanding of how the greenhouse production industry operates as a component of the broader horticulture industry. Coverage of this unit should also include discussions of possible sources of employment, apprenticeships, and further education.

In unit 2, safety rules related to specific materials, equipment, and environmental situations should be discussed, with particular emphasis on the safe handling of chemicals. General safety procedures in horticultural activities, and the responsibility of every student to follow them, should be given considerable attention at the beginning of the course. Safety procedures associated with specific operations and situations should be introduced when the appropriate circumstances arise. As the course proceeds, students should develop safe work attitudes and habits, including good housekeeping habits; a neat, well-kept greenhouse is a much safer environment than one that is not maintained properly. Students should be taught what to do if an accident occurs.

Repairing power tools and equipment (unit 3) is not a primary function of greenhouse production, but keeping the equipment in good running order through proper maintenance is important. If possible, a related technical course in small engines should be available to students studying greenhouse production and other horticulture subjects. In such a course, students can learn to make minor repairs and adjustments on a variety of power units associated with the horticulture industry.

Unit 5 investigates typical work activities associated with the methods of propagation introduced in the Intermediate Division. Students should be given the opportunity to experiment with various forms of propagation, using a wide variety of plants.

The treatment of unit 6 should help students to consistently identify plants commonly produced in greenhouses and used in experiments. Daily exposure to plant material labelled with common names will help students learn to recognize plants. A classroom plant stand, changed regularly, is also helpful. Botanical names should be taught and used where applicable.

The material in unit 7 will help students to recognize plant insects and diseases and the damage they cause. Students should recognize the characteristics of the injury and the proper means of control for each case. Weed identification and control should also be part of this unit.

The choice of plant materials to be produced in unit 8 will be determined by the type of facilities available. Where possible, the production of highly specialized commercial crops, such as poinsettias, lilies, geraniums, chrysanthemums, annual bedding plants, foliage plants, and vegetables, should be encouraged. In all approaches to this unit, the student should develop both knowledge and skills in the culture of several kinds of plants.

The content of unit 9 will be studied in depth, so that students can develop a good understanding of the relationship between soil and plants. Students should be able to identify and prepare soil mixtures for bench and pot crops, and they should understand soil sterilization. Soil tests for acidity and alkalinity, composition, and texture are desirable learning activities in this unit. Students should also develop an understanding of nutrient deficiencies and organic fertilizers and be able to apply fertilizer nutrients to various crops.

The study of unit 14 should help students learn the various types of greenhouse ranges, the factors involved in determining

greenhouse location, the names of greenhouse parts, the glazing and framing materials used, and the functions of the heating, ventilation, and cooling systems. Students should also learn about interior bench and bed arrangements and the construction of a misting propagation bench. The uses of cold frames, hot beds, and lath houses should also be part of this unit.

Coverage of unit 16 should convey the importance of keeping a greenhouse clean and maintained. Teachers should emphasize that debris and litter can form breeding grounds for insects and disease organisms.

A unique and practical opportunity for a hands-on approach to unit 17 is the operation of a retail sales area within the shop. Students can organize and operate this area and have direct contact with customers. Plants grown in the greenhouse can be sold to staff and to other students. Surplus plants, particularly bedding plants, can even be sold wholesale to other schools within the board.

The following are the kinds of activities that can be included in a greenhouse production course:

- The teacher can invite a resource person from a greenhouse production facility to discuss his or her operation.
- Students can tour various greenhouse companies to become familiar with various types of structures and equipment.
- Students can tour a greenhouse facility to observe propagation techniques; they should note which techniques are used with which plants.
- Students can prepare a plant identification notebook.
- Students can make drawings of flower parts and pollination methods.
- Students can prepare posters of propagation methods.
- Students can test soil for acidity and alkalinity and for nutrients.
- Students can build a cold frame, a hot bed, or a lath house.
- Students can work out a plan for producing a crop of chrysanthemums or hydrangeas for a special day such as Mother's Day or Easter. Sufficient time should be left for clean-up between crops.
- In early September, students can prepare a plan for producing a crop of poinsettias in the school greenhouse from cuttings that have been ordered. They should schedule dates for potting, lighting, shading, temperature control, and fertilizing. When plants are potted, this schedule should be posted in the greenhouse as a reminder. The same procedure can be followed with lilies.
- Students can take a field trip to a commercial greenhouse where chrysanthemums, hydrangeas, poinsettias, Easter lilies, tomatoes, and cucumbers are being grown. Students should note the cultural practices, facilities, and supplies used and the types of occupations involved in growing these crops.
- Through work experience at a greenhouse, students can gain experience in handling potted plants, cut flowers, and vegetables.
- Students can force tulips, daffodils, hyacinths, and minor bulbs.
- Students can visit a greenhouse and do the following:
 - a) observe the proper preparation of soil used in the bench or bed for growing cut flowers;
 - b) observe the procedure for pinching and disbudding chrysanthemums;
 - c) observe the grading, bunching, and packing of cut flowers.
- Students can visit a greenhouse range in which tomatoes or cucumbers are being grown and observe the techniques associated with the crop.
- Students can work out a rotation plan for a particular vegetable crop.
- Students can grow a tomato or cucumber crop in the school greenhouse.
- Students can prepare plant projects for competitions at local fairs and exhibitions.
- Students can visit horticultural-chemical plants.
- Students can learn the culture of crops such as potted roses, azaleas, African violets, carnations, snapdragons, roses, kalanchoes, Rieger begonias, and cyclamen.
- Students can set up sales areas in the shop to learn to sell greenhouse plants to staff and students.

- Students can test soil for nutrient deficiencies.
- Students can calculate the number of pots required for a 100-sq.-ft. or 9-m² area if plants are planted in 4-in. or 100-mm, 5-in. or 130-mm, 6-in. or 150-mm, 7-in. or 180-mm, and 8-in. or 200-mm pots.
- Students can calculate the costs per crop, from the purchase of cuttings to the sale of finished plant product.

General Level

Course codes assigned to general level courses planned under this section will be THG3G for Grade 11 and THG4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- become familiar with and learn to handle hazardous chemicals and materials;
- acquire knowledge of legislation governing safety in horticultural workplaces in Ontario;
- implement maintenance schedules and perform minor repairs on greenhouse tools and equipment in accordance with manufacturers' manuals;
- develop the skills necessary to function either as a co-operative member or as the leader of a group;
- acquire general knowledge of the principles of soil science relevant to greenhouse crop production and the knowledge and skill to prepare and apply fertilizers and potting mixtures for specific crops;
- increase their knowledge of plant terminology and classification, learning to identify, by both botanical and common names, a wide range of greenhouse-grown plant material;
- learn more about botany and demonstrate various methods of propagating plants asexually;
- develop and put into effect a complete maintenance program for a greenhouse operation, including sanitation;
- price greenhouse crops, set up displays of crop production, and market, advertise, and sell the products;
- develop the skills necessary to control pests that reduce greenhouse crop production, and become familiar with legislation governing the use of pest controls;
- gain further knowledge of the factors affecting greenhouse production and develop a system of record keeping;
- design a greenhouse, taking into consideration such factors as site, interior design, building materials, maintenance systems, and planned crops;
- explore the possibilities for further education and training and the career opportunities in the industry.

Suggestions for Teachers

Suggestions for teachers in the preceding sections of greenhouse production should be reviewed and adapted where appropriate for general level courses.

Students taking courses at the general level of difficulty may undertake short research assignments, exploring topics of particular interest to them. The method of writing the report on the assignment should be discussed with the English teacher. The report can be evaluated by the horticulture teacher for content and by the English teacher for style.

Unit 14 ("Greenhouse structures, systems, and construction") deals with the structure of a greenhouse and with the systems (e.g., electrical, watering, heating) that are essential to the production of a greenhouse crop. Many students find this unit one of the most interesting. Unit 14 identifies the conditions that must be taken into consideration in designing a greenhouse. Knowledge of drafting can help the student to produce design drawings for a greenhouse.

Good facilities can contribute significantly to the effectiveness of greenhouse production courses. The greenhouse should be located where it will receive adequate sunlight. It should also provide areas for two different temperatures – a warm house and a cooler house. An even-span construction is preferable to a lean-to construction, providing more favourable light and temperature conditions. Independent heating is preferable, and proper air-change equipment is required. In addition, an adequate moistureproof electrical supply should be available for the electrical accessories.

A potting room adjoining the greenhouse and separate from the classroom is recommended. A basement under the potting area or a room adjoining it is recommended for storage. A locked, well-marked cabinet with proper ventilation is recommended for storage of chemicals. It is desirable to have a fenced area for a lath house, hot beds, and cold frames. The greenhouse should also be surrounded by a fence.

Although an automatically controlled greenhouse is desirable for work in this subject, students can also learn from less-than-ideal facilities (e.g., those that include an artificial light stand). However, to carry out the learning experience of growing a flower or vegetable crop, a moderately well equipped greenhouse is highly recommended. An automatic misting propagation bench is desirable for the propagation of greenhouse material.

Publications and other resource materials for use in courses on greenhouse production can be obtained from a variety of sources:

- Each classroom should have a current copy of the Ontario Pesticides Act and regulations, available from the Ontario government bookstore in Toronto.
- The University of Toronto guidance centre has a series of monographs on horticulture and arboriculture. These provide information on the industry – advantages, disadvantages, wages, and the preparation required to work in each field.
- Community institutions that can be valuable resources for the horticulture teacher include universities and community colleges that offer adult training or postsecondary courses in the horticulture field, commissions such as the Niagara Parks Commission or the National Capital Commission in Ottawa, and horticulture associations.
- Commercial catalogues, slide sets, and other materials that contain illustrations of environmental-control equipment are useful in dealing with the content of unit 14.
- Commercial and wholesale seed catalogues are useful for ordering supplies and also aid in plant identification.

Evaluation of student achievement should be based on assessments of the student's progress in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should be based on assessments of the student's progress in developing and demonstrating practical skills. The remaining 40 per cent of the final mark should reflect the student's progress in learning theoretical principles and horticultural information and using this knowledge to solve problems related to the workplace. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Floral Design

Intermediate Division

(Grades 9 and 10)

Almost everyone appreciates flowers and plants and enjoys the beauty of flower arrangements. Flowers add brightness wherever they are placed, as well as signifying remembrance in times of sorrow. Arranging flowers attractively can be an interesting hobby for some, a rewarding occupation for others.

Courses in floral design are planned both for students who wish to enter employment as floral assistants and for those who simply wish to pursue an interest in flower arranging. These courses will provide knowledge about, and skill in the design and construction of, floral arrangements. Related activities such as merchandising and shop set-up are also included.

To respond effectively to questions from the educated consumer, the florist must be knowledgeable about all phases of floriculture. The theoretical component of floriculture is therefore developed progressively throughout the program.

The trade of floriculturist embraces a wide variety of skills. Students can be introduced to many of these through the various programs in floral design. The training profile for retail florist, produced by the Ministry of Skills Development, outlines the performance objectives and standards that have been identified by the industry. The content of the basic

apprenticeship course outlined in this training profile may be incorporated into appropriate portions of Intermediate and Senior Division courses in floral design.

Courses in floral design are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 6.1.9 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in floral design may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. Courses that are offered entirely in school may therefore range from one-quarter credit to two credits in any one year. Co-operative education components (described on pages 13 and 14 of *Technological Studies, Part A: Policy for Program Planning*) may be planned to support the in-school course work and to provide additional credits in this subject.

If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that core items be chosen to increase practical skills that may eventually lead to employment.

Chart 6.1.9
Core Content for
Floral Design
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	a	ab
1.3 Economic effects	c	c
2. Safety		
2.1 Accident prevention and safety rules	a	a
2.2 Precautions in the use of hazardous materials	a	a
2.3 Legislation		a
2.4 Tools and equipment	a	a
2.5 Accidents	a	a
2.6 Working environment	a	a

Content Units	Core Content for Courses	
	Basic	General
3. Tools and machinery		
3.1 Power units	ab	abf
3.2 Hand tools	abde	abde
4. Plant science		
4.1 Plant anatomy	a	de
4.2 Plant development	a	a
4.3 Plant classification	a	ac
4.4 Uses for plants	a	ad
6. Plant identification		
6.1 Naming	a	a
6.2 Definitions	de	ade
6.3 Plants for identification using common and/or botanical names	fo	afho
6.4 Plant recognition techniques	a	a
6.6 Collection of plants	ak	ak
16. Floral design		
16.1 Design theory	a	a
16.2 Construction materials	ac	abc
16.3 Design and construction	a	a
16.4 Customer relations	a	ab
16.5 Care of perishable floral materials	a	a

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THD1B for Grade 9 and THD2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire a positive attitude towards safe habits in the use of tools and materials;
- develop skills in the selection and use of appropriate tools and equipment;

- develop the communication skills required to function in the field of floral design;
- develop a positive attitude towards working co-operatively with both peers and supervisors;

- acquire the knowledge and skills required to design and construct basic flower arrangements, corsages, and novelty items; to take orders; and to care for perishable floral materials;
- learn to identify the cut flowers and foliage commonly used by retail florists;
- acquire basic knowledge of plants – structures and functions, processes and growth,

classification, and importance to the environment and the economy;

- be introduced to the area of floral design, the nature of the work involved in associated occupations, and the importance of the field to the national economy.

Suggestions for Teachers

In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to learn. Teachers can build confidence by providing students with as many opportunities as possible to experience success. Ensuring success is a challenge to the teacher's powers of observation, imagination, and patience. Wherever possible, learning should be related to the student's language and mathematical studies, in order to reinforce the importance of these subjects in the field of horticulture.

Students should be introduced to floral designs with an overview of the trade and possibly a slide presentation of some of the traditional methods of producing floral arrangements.

Very few injuries occur in flower arranging; nevertheless, safety is an issue that must be discussed. Sharp wires, power staplers, spray bombs, and various chemicals are all potential sources of injury that must be used correctly if accidents are to be avoided.

Unit 4 introduces students to the basic structure and development of a flower, as well as its classification. It is possible that some of the topics in this unit will be taught in a science course.

Students should be familiar with most of the common plants used for flower arranging. They should know both the common and the botanical names for the flowers they work with.

Students in a basic level program should be introduced to the principles of design with short but frequent lessons covering no more

than one design principle at a time. From these lessons the students will gradually develop an understanding of such principles as harmony, rhythm, colour, and contrast and come to appreciate the relationship of these principles to one another.

Unit 16.2 involves the materials used to hold flowers in place. Students should experiment with the various methods, to develop a sense of which method is most suitable for a particular type of arrangement. The design and construction of a corsage or a small floral arrangement using the principles of design and the appropriate techniques of construction will give students the satisfaction of producing a finished product.

The evaluation of student achievement in courses planned for the basic level of difficulty must recognize the emphasis placed on practical activity in these courses. Approximately 70 per cent of the final mark should be based on the practical component, and 30 per cent on the theoretical component. Students may be asked to demonstrate a particular task, knowing the criteria on which marks will be based. When written tests are given in class, they should be brief and clear and should cover a manageable unit of work. Frequent oral testing is an excellent way of assessing students' progress; administered individually, oral testing can benefit a student who has difficulty with written material. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to general level courses planned under this section will be THD1G for Grade 9 and THD2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire good safety habits and attitudes relative to the use of tools and materials and learn to recognize hazards;
- learn to select and use the tools and equipment of the retail florist;
- develop the communication skills required to function efficiently in the florist industry;
- acquire an understanding of the skills required to work co-operatively and to perform in leadership roles;
- acquire basic knowledge of floral design theory and demonstrate the ability to design and construct fresh flower arrangements and corsages;
- develop the ability to serve customers politely and efficiently;
- identify (using common and botanical names) a range of potted plant materials, local and imported cut flowers, and foliage types used in the retail florist industry;
- develop the skills and knowledge necessary to work with perishable materials;
- develop an awareness of plant structures, plant development, botanical classification, and the importance of plants to people;
- acquire knowledge of the retail florist industry – the nature of the work, wages, job opportunities, and the economic importance of the industry.

Suggestions for Teachers

Teachers planning courses at the general level of difficulty should review the suggestions made in the basic level section. Most of these suggestions can be adapted to suit general level courses.

Unit 1 should provide an overview of the floral field, including its impact on the local economy. Having students investigate and write a brief report on some sector of the floral industry is an excellent way of helping them gain insights into the industry.

Units 2 and 3 deal with the safe and effective use of the tools and equipment of the floral industry. In dealing with the unit on safety, the teacher should discuss the Workers' Compensation Act and its application to personnel in the floral industry.

Unit 4 ("Plant science") should provide students with an understanding of how plants grow and how plant growth can be maintained. When a florist sells a plant to a customer, the florist should be able to advise the customer on how to maintain the plant. Students should be encouraged to grow plants in their

homes and to experiment with plant growth by systematically altering the factors that affect it.

"Plant identification" (Unit 6) deals with such topics as naming plants according to their genera, species, and varieties. Students should be able to define such terms as *annual*, *bien-nial*, and *perennial* and should become familiar with plants in each of these categories. Students should be taught how to identify common greenhouse plants and cut flowers used in the floral industry. They should learn both the botanical and the common names of these plants and flowers. Because learning these names can be difficult for students, teachers should introduce them gradually. Games that require students to name various plants and flowers are effective teaching tools.

The content of unit 16 ("Floral design") forms the basis for a large part of the course. Students should develop the ability to sketch a design before they produce a finished product. Where possible, the art teacher can assist students in developing some of the basic skills they require for this sketching.

Before students can produce a floral arrangement, they must be taught the principles of design. Such topics as scale, balance and proportion, harmony, and texture must be discussed. Since most of these topics are theoretical, a good strategy is to deal with one or two at a time and have the students attempt to apply them. A suitable balance of theoretical principles and practical application should be achieved under this strategy. The actual construction of a corsage or a small bouquet should be the end result of this gradual learning process.

Students need to develop effective interpersonal skills for dealing with customers. Taking an order, answering a phone, and giving advice on what might be written on a sympathy card are all skills that must be taught.

The care of perishable floral material is an extremely important topic. Students must be taught to care for floral material so that there is as little waste as possible.

Evaluation of student progress should be related to the student's success in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should reflect practical skill development. The remaining 40 per cent of the final mark should reflect the student's understanding of theoretical principles and ability to use horticultural information in work-related activities. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Floral Design

Senior Division

(Grades 11 and 12)

Courses in floral design in the Senior Division acquaint students with the theory and practice of designing, constructing, and selling floral arrangements and handling potted plants. As well, students taking these courses study plant biology and the identification, protection, culture, and production of plants.

Courses based on this subject can prepare students for occupations in the retail florist industry. The training profile for this trade, produced by the Ministry of Skills Development, outlines the performance objectives and standards that have been identified by the industry. Where appropriate, the content of the basic apprenticeship course outlined in this training profile may be incorporated into Senior Division courses.

In order for students to acquire first-hand information on employment opportunities and

the availability of on-the-job training, they should participate in work experience and/or co-operative education programs as part of their Senior Division course work. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

Courses in floral design are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 6.1.10 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The courses may vary in time allotment and may be designed to offer credit for up to 330 hours of in-school work each year.

Chart 6.1.10
Core Content for
Floral Design
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Introduction and opportunities		
1.1 Career description and opportunities	cd	cd
1.2 Further training	a	ab
1.3 Economic effects	b	ab
2. Safety		
2.1 Accident prevention and safety rules	ab	ab
2.2 Precautions in the use of hazardous materials	bcd	bcd
2.3 Legislation	abc	bcd
2.6 Working environment	b	b
3. Tools and machinery		
3.1 Power units	f	c
3.2 Hand tools	c	c
3.4 Schedules and manuals	ab	ab
4. Plant science		
4.1 Plant anatomy		bcf
4.2 Plant development	e	e

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
4.3 Plant classification	c	bd
4.4 Uses for plants	cd	bc
6. Plant identification		
6.1 Naming	c	c
6.3 Plants for identification using common and/or botanical names	ahg	gpqr
6.4 Plant recognition techniques	b	b
6.5 Identifying plants for specific uses	cd	cd
6.6 Collection of plants	l	l
7. Plant protection		
7.1 Insects	cd	cde
7.2 Diseases	ac	ac
8. Plant culture and production		
8.5 Florist pot crops	a	ab
16. Floral design		
16.1 Design theory	b	b
16.2 Construction materials	b	
16.3 Design and construction	b	b
16.4 Customer relations	bc	cd
16.5 Care of perishable floral materials	b	b
17. Merchandising and marketing		
17.1 Cost analysis/pricing	ad	adf
17.3 Merchandising and display	abcde	abcdef

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be THD3B for Grade 11 and THD4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards safe work habits and the ability to use the tools and chemicals of the trade safely and effectively;
- improve on language and communication skills needed for work in the florist industry;
- develop the ability to work pleasantly and co-operatively with fellow workers, supervisors, and customers;
- further develop knowledge of, and ability to identify, floral materials, including imported cut flowers, dried flowers, and silk materials;
- become familiar with photoperiodic responses in plants, further botanical classifications, the dangers of some florist plants, and the uses of plants;
- acquire the ability to identify common insect and disease problems affecting floral crops;
- acquire knowledge of the cultural requirements and procedures for a variety of common florist pot crops;
- develop skills in the design and construction of dried and silk material arrangements and wedding and funeral floral displays;
- develop the ability to handle and properly store perishable materials;
- acquire knowledge of career opportunities, further training possibilities, and the economic contributions of the industry.

Suggestions for Teachers

Unit 1 should provide an overview of the floral field, including the environmental, aesthetic, and economic aspects of this expanding industry. To assist students in their career decisions, discussions should probe both the retail and wholesale florist trades. Students should become aware of the types of jobs most florists are expected to perform. For wholesale florists, these might include growing, cutting, and grading flowers, preparing cut flowers for shipment and shipping, delivering the flowers and/or plants, and possibly acting as a salesperson. Because most retail florist businesses are small, they have fewer specialized positions; an employee may be required to do such jobs as sweeping the floor, cleaning the refrigerator, answering the phone, and selling, as well as designing. Students should also learn in unit 1 the importance of the floral trade to the country's economy. The possibilities for apprenticeship programs and other forms of postsecondary education (night school, community colleges, private floral

design schools, Flowers Canada programs, etc.) should be mentioned to students, and appropriate literature on these opportunities made available.

In unit 2, discussions on the hazards of using spray bombs and other chemicals should include safety precautions to be taken when using these products in a confined area such as a classroom. Safety precautions for using floral tints and dip dyes should also be part of the program. Students should be made aware of relevant sections of the safety legislation and of safety associations that support this service field.

In the study of tools and equipment, students should be taught the importance of keeping hand tools sharpened. Dull tools tend to lead to accidents that cause injury. Techniques for storing, handling, maintaining, and using these tools are important learning for students in basic level courses.

Power equipment can be used for suitable projects, but only by well-prepared students. Preparation should always include a good understanding of the mode of operation of the equipment.

Some knowledge of botany is extremely important for comprehension of units on plant protection, plant propagation, plant culture, and environmental controls. Familiarity with the parts of flowers can also help students when they become involved with wiring flowers.

In unit 6, "Plant identification", it is important that students become familiar with the common names and spellings of the most frequently used floral materials. Plant identification stands can be set up by students, used daily, and changed frequently. Learning can be further augmented by weekly quizzes, with new plants or flowers added each week. The names of dried and silk materials should be included. Where appropriate, botanical names can be taught.

Unit 7 examines the insects and diseases that are most likely to attack plants. A working knowledge of these is necessary for anyone in the industry.

It is important for florists to know how to care for the various types of plants they sell, and they should be able to pass this information on to customers who purchase their plants. Unit 8 deals with topics involving plant growth and care. An interesting set of experiments can be set up in which students vary one or more factors governing plant growth and record the effects.

Students in the Senior Division should have experiences in designing a wide variety of floral arrangements. These can be created for special seasons and events throughout the school year, such as Christmas, Easter, and formal school dances.

Unit 16.3 will include aspects of floral design such as funeral work, moss work, wedding work, church arrangements, servicing of weddings, convention work, holiday specials, and everyday arrangements. Both understanding of theory and the ability to apply it in

practice are necessary for success in floral design. Emphasis should be placed on colour theory and on construction of the basic styles of floral arrangements.

Unit 16.5 deals with the proper methods for keeping cut flowers and foliage as fresh as possible for as long as possible. Quality of refrigeration, including temperature and relative humidity, should be emphasized.

In unit 17.3, the focus is on setting up and operating a retail shop in the classroom, particularly if one is not already available in the school. Such a project, by allowing students to deal first-hand with customers, helps to build self-confidence.

Teaching students to make telephone sales is another excellent way to build their self-confidence. Students need to learn how to take and give telephone orders and how to spell and record information correctly. The teacher may wish to take advantage of Bell Canada's offer to lend a practice system on which students can gain first-hand experience. Telephone work and wire services play a very important part in the trade. Sending flowers worldwide by wire provides same-day delivery in most cases. This service requires communication with fellow florists, who may be in other countries.

Field trips and work experience days are excellent learning experiences. These experiences should be available several times a year so that students can see the stores at such times as Christmas, Easter, Mother's Day, and the wedding season. Students can gain considerable product knowledge by being exposed to real flower shops, wholesale locations, and the greenhouses where a lot of the materials are grown.

Students in Senior Division programs should have the opportunity to become involved in an extended work experience or co-operative education program. In either program, students can acquire valuable experience in working with adults and dealing with situations that can take place only in a florist's shop.

Use of variable assessment techniques is another way to individualize the program and one that is particularly helpful for students who are behaviourally, physically, and/or intellectually exceptional. The chosen method of

assessment should be explained to students in advance of each learning experience. Care must also be taken to ensure sex equity in both assignment and evaluation of work.

General Level

Course codes assigned to general level courses planned under this section will be THD3G for Grade 11 and THD4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- further develop safe work habits and attitudes and become familiar with relevant sections of the safety legislation and the proper procedures for handling horticultural chemicals, tools, and equipment;
- develop the communication skills necessary to work in a retail florist shop;
- develop the ability to work pleasantly, cooperatively, and efficiently with customers and personnel in a florist shop;
- acquire further knowledge of cut flowers and foliage, potted, flowering, and green plants, and dried and silk materials used in the trade and learn to identify the floral materials by both common and botanical names;

- acquire knowledge of plant anatomy, development, classification, and uses;
- acquire knowledge of common insects and diseases that cause damage to floral materials and learn to identify the type of damage, its cause, and the means of controlling it;
- develop further knowledge of cultural practices for a wide range of florist pot crops;
- further develop knowledge, skills, and ability in design and construction techniques using fresh, dried, and silk materials;
- learn to care for perishable floral materials;
- explore the opportunities for further training and/or education, career opportunities, and the impact of the floral industry on the provincial economy.

Suggestions for Teachers

Teachers planning courses for the general level of difficulty should review the suggestions made for basic level courses. Most of these can be adapted for general level courses.

Projection of colour slides is an ideal way to illustrate for students a variety of applications for various floral materials. Weekly quizzes covering new flowers, greens, and accessories can also effectively increase their learning.

Students can help plan and produce some of the floral items that are used in school events such as commencement, spring fashion shows, assemblies, and board of education events. The more practice students have in fulfilling requests, the more proficient, under proper guidance, they will become. Students should

be given opportunities to work with a wide variety of materials, textures, and colours.

In their design activities, students at the general level should develop an appreciation of the need for practice and patience in the acquisition of general designing skills. The packaging of flowers, plants, and floral creations for delivery is also a useful skill that may be developed in these courses. The development of fine motor skills is a great challenge to the student.

In courses at the general level of difficulty, increased emphasis should be placed on acquisition of product knowledge, so that students will be able to give accurate responses to customer questions. Such questions could be about origin, propagation, culture, growth,

production processes, maintenance, or other aspects of cut flowers, plants, and floral materials.

Planning and scheduling a series of window and in-store displays for a florist shop is another appropriate project at the general level. Displays should be planned to complement other forms of advertising, to suit the season, and to facilitate traffic flow.

The Senior Division years in floriculture should be characterized by hands-on experiences, with the student working at all phases of the floral industry. Where such an experience involves working in a real florist or plant shop, it helps to prepare the student to join the work force.

Grade 12 experiences can include several short field trips to wholesalers and retailers. These can provide opportunities for students to explore job opportunities and to observe all phases of the industry first-hand. Not only do such field trips provide product knowledge, but they also help students to develop personal values, such as honesty and punctuality, that are useful in dealing with others.

To provide for the special needs of exceptional students, teachers should modify curriculum, equipment, and aids as necessary. Some modifications might be relatively simple, such as shortening classroom assignments and providing special types of tools and equipment set-ups. Local florists can also be asked for suggestions about where such students can fit into the industry. Florists are often willing to take interested students into their shops to help them find the area in which they would be happy and successful workers.

The following are activities that can be included in a course in floral design:

- Local florists can be invited to class to give demonstrations and general talks to the Senior Division students.
- Surplus flowers can be sought from funeral homes and used by students to express their design abilities.
- A class field trip can be made to wholesale flower growers or a flower market so that students can gain product knowledge.

- The class can investigate local job opportunities.
- Field trips to local florists can be made during the year to see the sales promotions for various holiday periods.
- Weekly quizzes on identification of plant materials can be scheduled; new floral accessories can be added weekly.
- Students can create floral arrangements for all school functions, including graduations, fashion shows, and school board functions.
- Students can undertake work experience programs in co-operation with local retail florists.
- Students can make corsages and floral arrangements, using a wide variety of materials, textures, and colours.

Speakers from local industry, such as floral designers, growers, wire-service personnel, greenhouse operators, and delivery people, add an important dimension to the course. It is vital that students be exposed to many different aspects of the trade so that they can decide just what part of it they want to investigate further.

Some students may take the floral design course to develop technical literacy. These students will benefit from opportunities to be creative with their hands and to use tools of the trade. An overview of the trade, including insights into the required skills and knowledge as well as the work environment in a flower shop, is also a desirable outcome.

Evaluation of student achievement should be based on assessments of the student's progress in achieving the course objectives. In horticulture courses at the general level of difficulty, 60 per cent of the final mark should be based on assessments of the student's progress in developing and demonstrating practical skills. The remaining 40 per cent of the final mark should reflect the student's progress in learning theoretical principles and horticultural information and using this knowledge to solve problems related to the workplace. Additional comments about the evaluation of student achievement are offered in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Summary of Core Content for Courses in the Horticulture Grouping

Chart 6.1.11

Content Units	General Horticulture (Grades 9-10)						Landscape Design and Maintenance (Grades 9-10)				Nursery Production (Grades 9-10)			
	(Grades 9-10)			(Grades 11-12)			(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)	
	Basic	Gen	Adv	Basic	Gen	Adv	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen
1. Introduction and opportunities														
1.1 Career description and opportunities	a	ab	ab	cd	cd	cd	a	ab	cde	cde	a	ab	cd	cd
1.2 Further training				a	ab	ab			a	ab			a	ab
1.3 Economic effects	a	a	a	b	ab	ab	c	c	b	ab	c	c	b	ab
2. Safety														
2.1 Accident prevention and safety rules	a	a	a	ab	ab	ab	a	a	ab	ab	a	a	ab	ab
2.2 Precautions in the use of hazardous materials	a	a	ac	bc	bcd	bd	a	a	bcd	bcd	a	a	bcd	bcd
2.3 Legislation		a	ac	a	b	bd		a	abc	bcd		a	abc	bcd
2.4 Tools and equipment	a	a	a				a	a			a	a		
2.5 Accidents	a	a	a				a	a			a	a		
2.6 Working environment	a	a	a	b	b	b	a	a	b	b	a	a	b	b
3. Tools and machinery														
3.1 Power units	aef	abef	abdef	bd	cd	c	aef	abef	bcd	cd	aef	abef	bcd	cd
3.2 Hand tools	ade	ade	abcde	bc	bc		abde	abde	c	c	abde	abde	c	c
3.3 Moving equipment				a	ab	ab			a	ab			a	ab
3.4 Schedules and manuals	a	a	a	b	b	b	a	a	b	b	a	a	b	b
4. Plant science														
4.1 Plant anatomy	a	bcd	bcd		ef	ef	a	bcd		ef	bd	bcd	ce	ef
4.2 Plant development	a	ad	ad		bce	bce	a	ab		cd	a	ab		cd
4.3 Plant classification	a	ac	abc		bd	cd	a	a	c	c	a	abc	b	d
4.4 Uses for plants	a	ad	ad	cd	bc	bc	a	ad	cd	bc	a	a	cd	cd
5. Plant propagation														
5.1 Sexual reproduction	ad	acd	abcd	fi	befhi	efghi	a	ad	f	f	ad	abcd	bfi	fgi
5.2 Asexual propagation	a	ab	abc	bei	cdefi	defgi		a	ab	bef	ab	abc	cefi	defghi
6. Plant identification														
6.1 Naming	a	ab	abc	bc	c		a	abc	c		ab	abc	c	
6.2 Definitions	ad	abc	abcde	bce	de		abc	abcfg	fg		abc	abcfg	fg	
6.3 Plants for identification using common and/or botanical names	ac	acin	acin	in	bdj	bdj	im	ikm	jkm	djln	i	ij	j	kl
6.4 Plant recognition techniques	a	a	ab	b	b		a	a	b	b	a	a	b	b
6.5 Identifying plants for specific uses		d	cd	ac	abc	abef	ab	abe	cef	cf	be	ab	af	ef
6.6 Collection of plants							ag	abc	bh	degjh		abd	afh	cdeh

Greenhouse Production (Grades 9-10) (Grades 11-12)				Floral Design (Grades 9-10) (Grades 11-12)			
Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen

a	ab	cd	cd	a	ab	cd	cd
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		a	ab			a	ab
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c	c	b	ab	c	c	b	ab
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a	a	ab	ab	a	a	ab	ab
---	---	----	----	---	---	----	----

a	a	bcd	bcd	a	a	bcd	bcd
---	---	-----	-----	---	---	-----	-----

	a	abc	bcd		a	abc	bcd
--	---	-----	-----	--	---	-----	-----

a	a			a	a		
---	---	--	--	---	---	--	--

a	a			a	a		
---	---	--	--	---	---	--	--

a	a	b	b	a	a	b	b
---	---	---	---	---	---	---	---

aef	abef	bcd	cd	ab	abf	f	c
-----	------	-----	----	----	-----	---	---

abde	abde	c	c	abde	abde	c	c
------	------	---	---	------	------	---	---

a	a	b	b			ab	ab
---	---	---	---	--	--	----	----

bde	bcd	cf	ef	a	de		bef
-----	-----	----	----	---	----	--	-----

a	ab	e	cde	a	a	e	e
---	----	---	-----	---	---	---	---

a	ac	c	bd	a	ac	c	bd
---	----	---	----	---	----	---	----

a	ad	cd	bc	a	ad	cd	bc
---	----	----	----	---	----	----	----

adi	abcdi	bef	efgh				
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a	ab	bei	cegi				
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ab	abc	c		a	a	c	c
----	-----	---	--	---	---	---	---

ade	ade			de	ade		
-----	-----	--	--	----	-----	--	--

ac	ace	bde	bdfg	fo	afho	ahg	gpqr
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a	a	b	b	a	a	b	b
---	---	---	---	---	---	---	---

cf	cf					cd	cd
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		ai	aik	ak	ak	l	l
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Content Units

Content Units	General Horticulture (Grades 9-10)						Landscape Design and Maintenance (Grades 9-10)				Nursery Production (Grades 9-10)			
	(Grades 9-10)			(Grades 11-12)			(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)	
	Basic	Gen	Adv	Basic	Gen	Adv	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen
7. Plant protection														
7.1 Insects				cd	cdf	cdef	cd	abc	abef	defg	cd	abc	abef	defg
7.2 Diseases				ac	abcd	abcde	ab		cde	abcde		ab	cde	abcde
7.3 Weeds				ad	abcd	abcde	ac	ab	bde	cdef	ac	ab	bde	cdef
7.4 Other pests									a	a			a	a
7.5 Winter and/or storage protection									cd	cd	a	a	bc	bc
8. Plant culture and production														
8.1 Greenhouse crops	a	a	a	bf	bcf									
8.2 Vegetable crops					ac	abc								
8.3 Fruit crops					a	ab								
8.4 Nursery crops											a	a	b	b
8.5 Florist pot crops														
9. Soils and fertilizers														
9.1 Soil science	ac	acde	abcd	be	bfg	efgh	ab	abc	cde	deh	abc	abc	def	defgh
9.2 Physical, chemical, and biological features of soil	adf	abf	abcdf	chk	cdeghk	efghijkl	a	ad	bdfg	bchk	abfg	abcf	cdehl	deghkl
9.3 Fertilizers	ad	ab	ab	bcef	cdef	cdef	ab	ab	cde	cde	ab	ab	cde	cdef
9.4 Soil mixtures	a	ab	ab	bcd	cde	cde								
9.5 Soil management									a	acg	abd	abc	ceg	defg
10. Landscape planning and design														
10.1 Residential and/or commercial landscape design				cf	acf	abcfg	abc	abc	dfg	defg				
10.2 Landscape design for public areas							ae	abc	cfh	defgh				
10.3 Interior plantscape design							a	ab	bc	cd				
10.4 Landscape drafting and surveying				ac	abcg	abcdg	ab	ab	cdeg	cdefg				
11. Landscape construction														
11.1 Estimating and costing							a	a	b	bc				
11.2 Construction and/or installation of landscape features							a	ab	bce	cde				
11.3 Planting				agh	abcdg	abcdeg	abc	abcd	degh	efgh	adg	adegh		
12. Grounds maintenance														
12.1 Lawn maintenance	a	abc	abcde				acd	acd	bef	bef				
12.2 Planting area maintenance	acd	acd	acd	b	b	b	ac	ac	bd	bd				
12.3 Plant maintenance	b	b	b	ac	ac	ac	bc	bcd	adf	aef	b	b	acd	acd
12.4 Maintenance programming					a	a			a	a			a	a

a a

Content Units	General Horticulture (Grades 9-10)						Landscape Design and Maintenance (Grades 9-10)				Nursery Production (Grades 9-10)			
	(Grades 11-12)			(Grades 11-12)			(Grades 11-12)		(Grades 11-12)		(Grades 11-12)		(Grades 11-12)	
	Basic	Gen	Adv	Basic	Gen	Adv	Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen
13. Nursery operations														
13.1 Types, designs, layouts											a	a	b	bc
13.2 Location											a	a	b	bc
13.3 Planting/digging operations – field-grown stock											a	ab	bd	cde
13.4 Production of container-grown stock											a	a	b	bc
13.5 Storage and display facilities											a	a	bc	bc
14. Greenhouse structures, systems, and construction														
14.1 Factors affecting site selection														
14.2 Types and layouts				a	ab	abc								
14.3 Construction materials and designs				ac	abc	abc								
14.4 System designs														
15. Nursery and greenhouse sanitation														
15.1 Sanitation				ab	abc	abc					a	a	bd	bd
15.2 Problem areas				bc	bc	bc							ac	ac
16. Floral design														
16.1 Design theory														
16.2 Construction materials														
16.3 Design and construction														
16.4 Customer relations														
16.5 Care of perishable floral materials														
17. Merchandising and marketing														
17.1 Cost analysis/pricing													bcf	cdef
17.2 Marketing and advertising													a	ab
17.3 Merchandising and display				ae	acef	acdef							acde	acdef

See "Course Content for the Horticulture Grouping", beginning on page 72, for description of the subunits a, b, c, etc.

Greenhouse Production				Floral Design			
(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)	
Basic	Gen	Basic	Gen	Basic	Gen	Basic	Gen

	a	c	b
ab	ab	c	c
a	a	bc	bc
c	ac	eg	bdefg

a	a	bcd	bcd
		bc	bc

a	a	b	b
ac	abc	b	
a	a	b	b
a	ab	bc	cd
a	a	b	b

a	ab	bcd	cdef	ad	adf
		a	ab		
		acde	abcdef	abcde	abcdef

Course Content for the Horticulture Grouping

1. Introduction and opportunities

- | | |
|--|--|
| 1.1 Career description and opportunities | <ul style="list-style-type: none"> a) History of the subject/profession; nature of work; explanation of terms; occupations and related jobs; b) wages and job descriptions; c) professional and career opportunities; d) benefits; local firms; obligations and rights of the employer and employee as described in the Canada Labour Code; e) history and growth of interior plantscaping. |
| 1.2 Further training | <ul style="list-style-type: none"> a) Apprenticeships and further training; b) postsecondary education. |
| 1.3 Economic effects | <ul style="list-style-type: none"> a) Scope and importance to the local economy; b) scope and importance to the provincial economy; c) scope and importance to the national economy. |

2. Safety

- | | |
|---|---|
| 2.1 Accident prevention and safety rules | <ul style="list-style-type: none"> a) In the shop at school; b) in the retail outlet; in the field. |
| 2.2 Precautions in the use of hazardous materials | <ul style="list-style-type: none"> a) Flammable fluids, fumes; b) chemicals; c) spray bombs; d) fire control. |
| 2.3 Legislation | <ul style="list-style-type: none"> a) Ontario Workers' Compensation Act; b) Ontario Occupational Health and Safety Act; c) Industrial Accident Prevention Association (IAPA) – functions and programs; d) other safety legislation. |
| 2.4 Tools and equipment | <ul style="list-style-type: none"> a) Care and proper use of hand tools and equipment; care in starting and operating engines and machinery. |
| 2.5 Accidents | <ul style="list-style-type: none"> a) Care and proper handling of accidents; reporting procedures. |
| 2.6 Working environment | <ul style="list-style-type: none"> a) Recognizing unsafe working conditions and habits; adopting safe working conditions and habits – behaviour, clothing, and housekeeping; b) using protective clothing and footwear; storing materials and equipment safely. |

3. Tools and machinery

- | | |
|---------------------------|---|
| 3.1 Power units | <ul style="list-style-type: none">a) Types and uses, cleaning, operating safely, storing; using power supplies (gas, electricity) safely;b) adjusting;c) repairing;d) sharpening;e) fuel mixes;f) selecting. |
| 3.2 Hand tools | <ul style="list-style-type: none">a) Types and uses, cleaning, operating safely, storing;b) adjusting;c) repairing;d) sharpening;e) selecting. |
| 3.3 Moving equipment | <ul style="list-style-type: none">a) Using and transporting horticultural equipment and machinery on public roads;b) by-laws regulating the use and transportation of horticultural equipment and machinery on public roads. |
| 3.4 Schedules and manuals | <ul style="list-style-type: none">a) Importance and use of manuals for hand and power tools;b) importance and use of maintenance schedules for power equipment. |
-

4. Plant science

- | | |
|--------------------------|---|
| 4.1 Plant anatomy | <ul style="list-style-type: none">a) Plant structures and their functions;b) types, structure, and growth of roots;c) types, structure, and growth of stems;d) types, structure, and growth of leaves;e) types and structures of flowers;f) types and structures of fruit. |
| 4.2 Plant development | <ul style="list-style-type: none">a) Processes and growth;b) phototropism;c) plant mutations;d) plant hormones;e) photoperiodic responses of plants. |
| 4.3 Plant classification | <ul style="list-style-type: none">a) Linnaean system;b) binomial nomenclature;c) species;d) taxonomy. |
| 4.4 Uses for plants | <ul style="list-style-type: none">a) Importance of plants to human and animal life;b) plant medicines;c) plant poisons;d) other uses. |
-

5. Plant propagation

- | | |
|-------------------------|---|
| 5.1 Sexual reproduction | <ul style="list-style-type: none"> a) Pollination and fertilization; seeding operations; transplanting; b) seed collecting, storing, ripening, scarifying methods and techniques; c) germination testing; d) seeding media; e) artificial pollination, hybridization; f) seed identification; g) commercial seed production; h) reproduction by spores; i) record keeping. |
| 5.2 Asexual propagation | <ul style="list-style-type: none"> a) Rooting media, rooting hormones; cuttings (root, stem, leaf); b) division, plantlets; c) corms, bulbs, scales; d) rhizomes, stolons; e) layering; f) grafting; g) meristematic propagation; h) commercial propagation of woody plant materials; i) record keeping. |

6. Plant identification

- | | |
|---|---|
| 6.1 Naming | <ul style="list-style-type: none"> a) Common names; b) formal botanical names; c) reasons for using common and botanical names. |
| 6.2 Definitions | <ul style="list-style-type: none"> a) Annual, biennial, perennial; b) woody plants, herbaceous plants; c) coniferous, deciduous, evergreen, deciduous conifer; tree, shrub, vine; d) potted plants – flowering, green, tropical; e) pot crop, bench crop; f) ornamental landscape; g) native. |
| 6.3 Plants for identification using common and/or botanical names | <ul style="list-style-type: none"> a) Common greenhouse potted crops – flowering, green, tropical; b) additional greenhouse potted crops; c) common greenhouse bedding plant crops; d) additional greenhouse bedding plant crops; e) common greenhouse vegetable crops; f) common commercial greenhouse and field-grown cut flower crops; g) additional commercial cut flower crops; h) common imported cut flower crops; i) common nursery-grown ornamental landscape plants; |

	<ul style="list-style-type: none"> j) additional nursery-grown ornamental landscape plants; k) common native landscape plants; l) additional native landscape plants; m) common bulb crops; n) common vegetable, fruit, and small fruit plants grown in the province; o) types of foliage commonly used in floral design; p) additional types of foliage used in floral design; q) common dried and fabric materials used in floral design; r) additional dried and fabric materials used in floral design.
6.4 Plant recognition techniques	<ul style="list-style-type: none"> a) Visual; b) use of collections, keys.
6.5 Identifying plants for specific uses	<ul style="list-style-type: none"> a) Plants for colour – annuals, biennials, perennials, bulbs; b) plants for specific purposes – shade, sun, hedges, specimen; c) green plants and tropicals suitable for interior use; d) flowering potted plants – seasonal and/or continually available; e) basic plants suitable for landscaping; f) outdoor plants according to hardiness.
6.6 Collection of plants	<ul style="list-style-type: none"> a) Types of collections – flowers, fruit, leaves, branches/stems, bark, wood, plants for specific uses; methods of pressing, drying, preserving, mounting, and labelling; b) woody plants; c) native woody plants; d) specimen trees; e) evergreens; f) common nursery plants; g) common landscape plants according to hardiness zones; h) annuals, biennials, perennials, bulbs; i) common and/or specialized greenhouse flowering, bedding, green tropical, and vegetable plants; j) plants for interior landscaping; k) cut flowers and foliage; l) dried and silk materials.

7. Plant protection

7.1 Insects	<ul style="list-style-type: none"> a) Common orders; b) life cycles; c) identifying insects; d) recognizing damage; e) chemical, biological, and mechanical controls; f) preventive measures; g) Ministry of the Environment regulations.
7.2 Diseases	<ul style="list-style-type: none"> a) Defining, classifying; biological diseases – diagnosing and identifying causes; b) biological diseases – preventing and controlling; c) environmental diseases – diagnosing and identifying causes; d) environmental diseases – preventing and controlling; e) Ministry of the Environment regulations.
7.3 Weeds	<ul style="list-style-type: none"> a) Defining; identifying; b) classifying; c) problems created; d) chemical and/or physical controls; e) preventive measures; f) Ministry of the Environment regulations.
7.4 Other pests	<ul style="list-style-type: none"> a) Identifying and controlling other pests – animals, birds, humans; preventive measures.
7.5 Winter and/or storage protection	<ul style="list-style-type: none"> a) Reasons for winter protection of field- and container-grown stock; reasons for protection of stock in storage; b) methods of winter plant protection for field- and container-grown stock; methods of protection for stock in storage; c) characteristics of winter and/or storage injury to plants; d) winter protection for plants in the landscape.

8. Plant culture and production

8.1 Greenhouse crops

- a) Culture of individual common flowering greenhouse crops according to: type of crop, method of propagation, pot or bench grown, seasonality/specific use, approximate crop time, timing, pot size(s) (where applicable), growing medium, pH requirements, nutrition, temperature, watering, use of growth regulators, photoperiod control, pruning (pinching), insect and disease problems and controls, harvesting, grading, packing, storage, shipping, special instructions; culture of individual common spring bedding plants according to: type of crop, seeding date, seeding medium, germination temperature, germination time, light or dark for seed germination, when to transplant, transplanting medium, type and size of container, growing on temperature, nutrition, approximate total crop time from seed to sale, use of growth regulators, insect and disease problems and controls, special instructions;
- b) culture of additional individual flowering greenhouse crops as per (a) above;
- c) culture of individual common green plants and tropical plants according to: type of crop, method of propagation, growing medium, pH requirement, temperature, nutrition, watering, approximate crop time, pot size, repotting, light requirements, shading, atmospheric requirements, pruning, use of growth regulators, insect and disease problems and controls, holding areas for marketable plants, shipping, special instructions;
- d) culture of additional individual green plants and tropical plants according to (c) above; culture of individual greenhouse vegetable crops according to: type of crop, method of propagation, temperature, light/shade requirements, growing medium, pH requirements, watering, nutrition, pollination techniques (where applicable), pruning, use of growth regulators, insect and disease problems and controls, harvesting, grading, packing, storage, shipping, special instructions, hydroponic culture;
- e) culture of additional individual spring bedding plants according to (a) above;
- f) record keeping for greenhouse crops.

8.2 Vegetable crops

- a) Classifying vegetables; culture of individual common vegetable crops according to: type of crop, method of propagation, field seeding versus greenhouse transplants, soil requirements, pH requirements, water, nutrition, field preparation, cultivation techniques, pollination techniques, insect and disease problems and control, crop rotations, harvesting, grading, packing, storing, shipping, special instructions;
- b) culture of additional vegetable crops as per (a) above;
- c) record keeping for vegetable crop production.

8.3 Fruit crops

- a) Classifying fruit crops; culture of individual common fruit crops according to: type of crop, method of propagation, root stocks, soil and pH requirements, planting procedures, water, nutrition, field preparation, pruning, staking, training, thinning, pollination techniques, cultivation techniques, length of time before bearing fruit, insect and disease problems and controls, spray programs, harvesting, grading, packing, shipping, storing, special instructions; record keeping for fruit crop production;
- b) culture of additional individual fruit crops as per (a) above.

8.4 Nursery crops

- a) Classifying nursery crops; culture of individual common nursery crops, field grown and/or container grown, according to: type of crop, method of propagation, crop time, hardeners, soil and pH requirements, water, nutrition, lining out, potting, transplanting, repotting, cultivation techniques, pruning, staking, root pruning, winter protection, insect and disease problems and controls, digging techniques (bare root, balled and burlapped), grading, packing, shipping, storing, special instructions; record keeping for nursery crop production;
- b) culture of additional individual nursery crops as per (a) above.

8.5 Florist pot crops

- a) Cultural practices for a variety of basic florist pot crops, e.g., poinsettia, hydrangea, Easter lily, chrysanthemum, geranium, cyclamen, and azalea, under the following headings: name, availability/occasion, blooming period and length, propagation, soil mix, container (type and size(s)), fertilizing, watering, timing, photoperiod (length and control), crop production time, insect/disease problems and control, special notes/instructions, instructions to customers;
- b) cultural practices for a wide range of common flowering pot crops.

9. Soils and fertilizers

9.1 Soil science

- a) Soil formation;
- b) soil profiles;
- c) components of a soil;
- d) soil classification;
- e) soil types – local;
- f) soil types – provincial;
- g) soil types – national;
- h) the role of soil science.

9.2 Physical, chemical, and biological features of soil

- a) Soil texture; organic matter, humus;
- b) soil moisture;
- c) soil porosity;
- d) soil aeration;
- e) soil temperature;
- f) desirable composition;
- g) water movement and drainage;
- h) chemical composition;
- i) soil colloids;
- j) soil cations and anions;
- k) soil reaction and the pH scale; biological properties and reactions in soil;
- l) soil micro-organisms and their importance.

9.3 Fertilizers

- a) Plant requirements – major nutrients; fertilizer types – inorganic, granular (light-weight, heavyweight), liquids; organic – compost, manures;
- b) plant requirements – minor nutrients;
- c) fertilizer analysis;
- d) soil samples and testing;
- e) applying fertilizers (nutrients) for specific purposes – methods, timing, quantities;
- f) constructing a compost pile.

9.4 Soil mixtures	<ul style="list-style-type: none"> a) Definition; mixtures versus garden soil; b) ingredients; c) soil mixtures versus soil-less mixtures; soil pasteurization/sterilization; d) soil mixtures for specific purposes; e) fertilizer incorporation.
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9.5 Soil management	<ul style="list-style-type: none"> a) Problem soils; b) tillage and tilth; c) soil erosion and control; d) mulching and ploughing effects; e) nitrogen-fixing plants; f) drainage techniques; g) soil conservation.
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10. Landscape planning and design

10.1 Residential and/or commercial landscape design	<ul style="list-style-type: none"> a) Definitions; b) history of landscape design; c) principles of landscape design; types of garden designs; areas of a design; d) analysing and evaluating existing conditions; analysing and evaluating needs and requirements; e) evaluating drainage; design features – rockeries, pools, waterfalls, patios, walks, play areas; f) locating and designing planting areas; selecting appropriate plant material; g) selecting plant material for seasonal colour.
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10.2 Landscape design for public areas	<ul style="list-style-type: none"> a) Definition; types of areas; history of public area design; b) analysing and evaluating existing conditions; c) analysing and evaluating needs and requirements; d) evaluating drainage; e) designing and locating planting areas; selecting appropriate planting material; f) selecting plant material for seasonal colour; designing and locating walks; designing and locating quiet areas; g) lighting; h) designing for the handicapped.
--	--

10.3 Interior plantscape design	<ul style="list-style-type: none"> a) Definitions; history of interior plantscaping; analysing and evaluating existing conditions; b) analysing and evaluating needs and requirements – climate and humidity, water and drainage, lighting;
---------------------------------	---

-
- c) designing and locating planting areas; selecting appropriate plant material; designing and locating features such as pools and waterfalls;
 - d) planning for year-round colour; constructing a model.
-

10.4 Landscape drafting and surveying

- a) Definition; use of scale; drawing projects;
 - b) landscape measurement;
 - c) use of drawing instruments;
 - d) elementary surveying;
 - e) use of dumpey level;
 - f) use of transit;
 - g) model construction.
-

11. Landscape construction

11.1 Estimating and costing

- a) Interpreting landscape plans; estimating and costing construction of planting areas; estimating and costing lawn construction from sod and/or seed;
 - b) estimating and costing various landscape features (where appropriate), such as walls, fences, walks, patios, pools, rockeries; estimating and costing planting of other materials such as individual and/or specimen trees and hedges;
 - c) estimating and costing construction of interior plantscaping features (where appropriate), such as planting areas, climate control systems, lighting systems, watering systems, pools, and waterfalls.
-

11.2 Construction and/or installation of landscape features

- a) Planting areas – soil preparation, drainage features; lawns – sod, seed; rockeries;
 - b) walls; patios, decks;
 - c) walls, fences; pools, waterfalls; garden lighting;
 - d) play areas and facilities; interior plantscape systems – climate, drainage, water, lighting, etc.;
 - e) interior planting areas.
-

11.3 Planting

- a) Proper procedures for plants that are bare root, balled and burlapped, container grown;
- b) sodding techniques;
- c) seeding techniques;
- d) guying and/or staking trees;
- e) hedging materials;
- f) plants in pools (exterior and/or interior);
- g) planting annuals;
- h) planting bulbs.

12. Grounds maintenance

- | | |
|--------------------------------|--|
| 12.1 Lawn maintenance | <ul style="list-style-type: none"> a) Cutting, trimming, edging; b) raking, thatching; c) rolling; d) watering; e) feeding/fertilizing; f) renovating a lawn. |
| 12.2 Planting area maintenance | <ul style="list-style-type: none"> a) Cultivating, weeding, edging; b) watering; c) feeding/fertilizing; d) preparing for spring planting (annuals); mulching; e) preparing for fall planting (bulbs). |
| 12.3 Plant maintenance | <ul style="list-style-type: none"> a) Feeding; b) cultivating, mulching; c) pruning, trimming; d) staking, guying techniques; e) recognizing and controlling stress symptoms in interior plants; f) interior plantscape maintenance. |
| 12.4 Maintenance programming | <ul style="list-style-type: none"> a) Planning complete maintenance programs for commercial, industrial, and residential areas, public parks. |
-

13. Nursery operations

- | | |
|--|---|
| 13.1 Types, designs, layouts | <ul style="list-style-type: none"> a) Types, definitions; design and layout of growing/wholesale nurseries; b) design and layout of retail nursery/garden centre operations; seasonal activities in various types of nurseries; c) establishing and maintaining show gardens for plant identification and observation of growth. |
| 13.2 Location | <ul style="list-style-type: none"> a) Climate, plant hardiness zone, exposure; b) soil type(s), transportation facilities; c) locating according to population/growth areas. |
| 13.3 Planting/digging operations – field-grown stock | <ul style="list-style-type: none"> a) Definition of <i>field grown</i>; preparing soil for planting; b) planting – timing, methods; layout of rows – for lining-out stock, whips, etc.; root pruning, transplanting; c) irrigation; d) digging – timing, hand and mechanical methods for bare-root, balled-and-burlapped stock; grading nursery stock; e) digging large trees. |
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13.4 Production of container-grown stock	<ul style="list-style-type: none"> a) Definition of <i>container grown</i>; preparing soil mixtures; potting operations – timing, methods; b) repotting operations – timing, methods; irrigation; shading techniques; c) crop production time.
13.5 Storage and display facilities	<ul style="list-style-type: none"> a) Types, definitions; storage of fall-dug stock for spring shipping – types of structures, temperature, humidity and moisture, use of antidessicants; b) summer storage of dug, unsold stock; lath house design and construction; c) displaying nursery stock – bare rooted, balled and burlapped, container grown, large trees, annuals, and perennials; shading and watering methods.
14. Greenhouse structures, systems, and construction	
14.1 Factors affecting site selection	<ul style="list-style-type: none"> a) Crops to be grown; climate, exposure; b) land and labour costs; market availability; transportation facilities; c) general overview of factors.
14.2 Types and layouts	<ul style="list-style-type: none"> a) Common styles in use; b) advantages and disadvantages of various styles; c) interior design and layout based on type of greenhouse and crop to be grown.
14.3 Construction materials and designs	<ul style="list-style-type: none"> a) Framing materials; glazing materials; b) bench and bed styles of materials; c) cold frames, hot beds, lath houses.
14.4 System designs	<ul style="list-style-type: none"> a) Analysing requirements; b) advantages and disadvantages of manual and automatic system designs; c) heating – conventional and non-conventional; ventilation; cooling; water; carbon dioxide enrichment; d) lighting; e) photoperiod control; shading; misting systems; f) maintenance of systems; g) carbon dioxide enrichment.

15. Nursery and greenhouse sanitation

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|--------------------|--|
| 15.1 Sanitation | a) Definitions; reasons, advantages, disadvantages;
b) disinfecting techniques for tools, equipment, containers;
c) cleanliness in the greenhouse;
d) painting and maintenance as sanitation. |
| 15.2 Problem areas | a) Recognizing problem materials and areas in nurseries – dead stock, weeds, refuse, storage areas;
b) recognizing problem areas in greenhouses – areas containing dead leaves and stock, corners of benches and structures, spaces under benches, dust- and dirt-collecting areas, storage areas;
c) eradicating problems in problem areas. |
-

16. Floral design

- | | |
|------------------------------|---|
| 16.1 Design theory | a) Principles: design, scale, balance, proportions, harmony, texture, rhythm, contrast colour wheel and basic colour theory;
b) advanced colour theory. |
| 16.2 Construction materials | a) Wire – types, gauges, uses; ribbon – types, uses;
b) containers; adhesives – types, uses;
c) flower holders – foams, greens, vermiculite, styrofoam, chick wire; advantages and disadvantages of each type. |
| 16.3 Design and construction | a) Wire methods – flowers and foliage for corsage construction; making a bow; taping; corsage stylings; designing and constructing novelty items, e.g., poodle heads; growth styles of flowers – line, mass, form, filler; “space and face as you place”; design and construction techniques for basic floral arrangements – symmetrical and asymmetrical triangles, circular (including round and oval), vertical, L-shaped; |

	b) design and construction techniques for additional styles of floral arrangements – horizontal, Hogarth curve, crescent; designing with dried and silk materials; funeral tributes; wedding work; arrangements for specific purposes/occasions – hospitals, Christmas, Valentine's Day, Mother's Day, birthdays, etc.; techniques for contemporary and futuristic arrangements – parallel stylings, landscape stylings, blocking colours, European designs, etc.
16.4 Customer relations	a) Greeting the customer; taking an order; b) answering the phone; c) processing the order; using wire services; d) wedding services, funeral services, and other special occasions.
16.5 Care of perishable floral materials	a) Refrigerators – types, uses; cleanliness and sanitation in the refrigerator and flower containers; care and handling of cut flowers and foliage in the school shop – chain of life; b) refrigerator environment – temperature, humidity; care and handling of cut flowers and foliage in the retail shop – chain of life; storage of dried flowers and materials.
17. Merchandising and marketing	
17.1 Cost analysis/pricing	a) Operating costs of a business, such as utilities, insurance, rent, and depreciation; material costs – pots, plants, seed, soil, soil mix ingredients, fertilizer, chemicals, floral design materials, as needed; labour costs – seasonal, year-round; b) value of and required profit from bench/bed space per square metre per year; c) costing a crop; d) allowances for perishable materials; e) packaging, shipping costs; f) pricing structures – grower, wholesaler, retailer.
17.2 Marketing and advertising	a) Objectives and concepts of marketing; quality and quantity control; perishability control; forms of advertising; seasonal promotion of goods; b) distribution of goods; objectives and concepts of advertising.

17.3 Merchandising and display

- a) Setting up a merchandising area in the shop, greenhouse, and/or school store;
 - b) designing and constructing a window display;
 - c) displays in the retail store;
 - d) techniques and personal qualities needed for sales;
 - e) pricing goods;
 - f) controlling inventory.
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Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

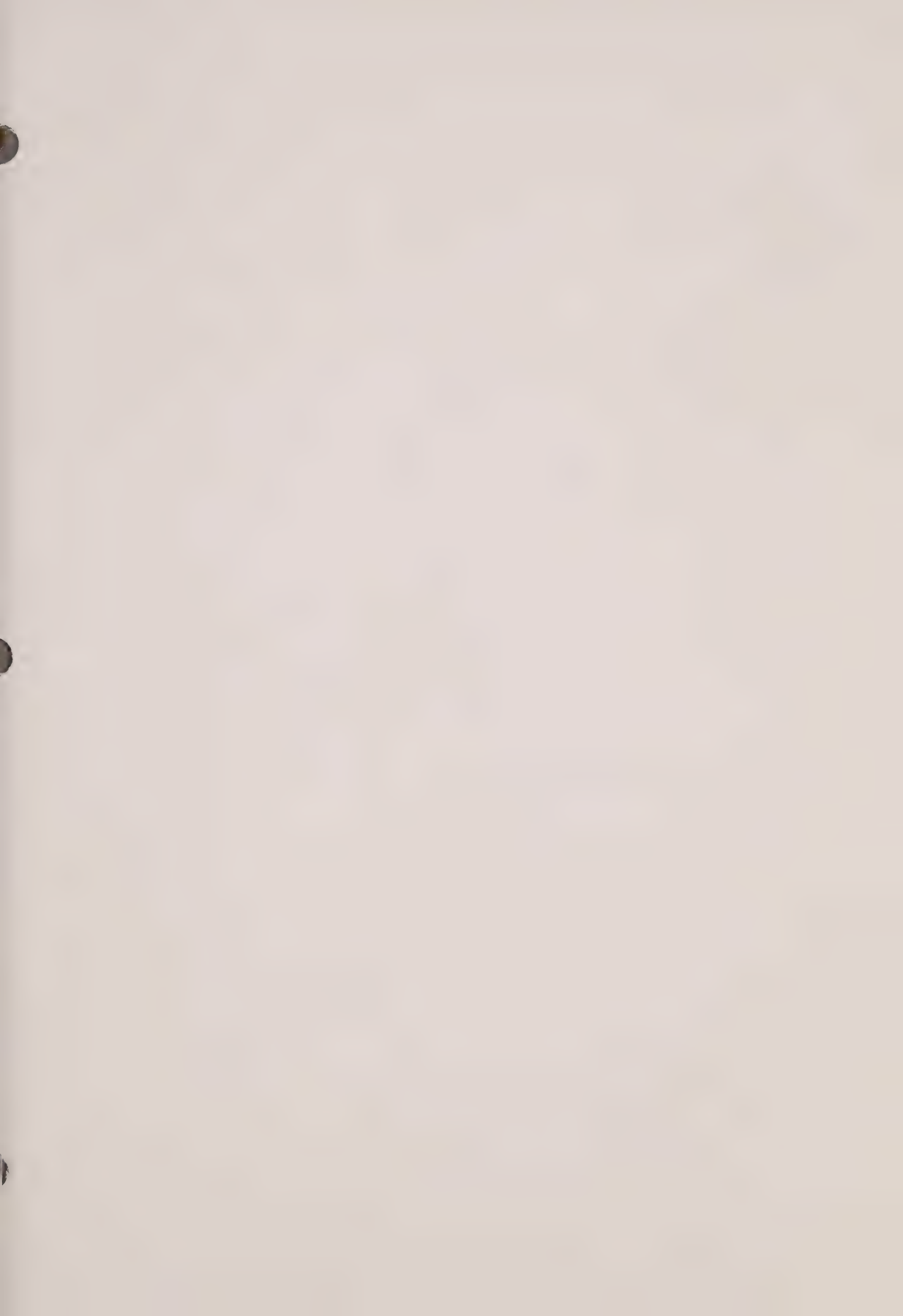
	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
4. Food Services Grouping	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU







Module 1, 1987

General Horticulture (Grades 9-12)

Landscape Design and Maintenance (Grades 9-12)

Nursery Production (Grades 9-12)

Greenhouse Production (Grades 9-12)

Floral Design (Grades 9-12)

Curriculum Guideline

CA24N
DE
- T27B

Technological Studies

*Intermediate and
Senior Divisions*

Part B

*8. Manufacturing
Grouping*

Module 1, 1986



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Introduction to the Manufacturing Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, *Part B*, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. *Part A* provides essential background for the planning of all courses in technological studies. The following three sections in *Part A* are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of *Part B* are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in *Part B* is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the manufacturing grouping. The grouping includes five subjects: machine shop practice; sheet metal practice; welding; foundry practice; and power transmission and control, and industrial control – power and processes. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, the courses will be their initial introduction to the occupational areas within the manufacturing grouping. For some, enrolment will be the first step towards an apprenticeship as a machinist. For others, it will be an introduction to another occupation such as sheet metal mechanics or welding. For many, it will lead to postsecondary studies. While each of the five subjects outlined in this document deals with unique content, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses in any of these five subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic, general, and (where authorized) advanced level courses. Each section

includes aims and suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific learning objectives, which shall be based on the aims for courses at the basic, general, and advanced levels. The nature of the core aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Manufacturing Grouping", at the end of this module, or from the course content listed at the end of any other module in *Part B*.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the manufacturing grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content

for the Manufacturing Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 8.1.6 provides a summary of the core content for all courses in the manufacturing grouping. This summary chart is intended to provide a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Manufacturing Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, appropriate content from drafting or blueprint reading in the graphics component may be incorporated into the machine shop practice program.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in manufacturing, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 machine shop practice, general and advanced levels) or at different grade levels (e.g., sheet metal practice in Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students acquire these skills, they are motivated to acquire related knowledge and develop desirable attitudes and understanding. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational

steps of the process, whether it is turning a piece of metal on a lathe or producing a weld. Significant aspects of the completed operation are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in manufacturing courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's achievement on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained through these experiences is particularly important to young people, who can expect to face a working life characterized by changing technology and the need to continually update their skill and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning. For example, software that is currently under development for the Ontario Approved Educational Micro-computer (OAEM) to support specific objectives in the welding program could be used in each of these ways.

Students should also have opportunities to become aware of the various tasks that computer technology performs in manufacturing. Visits to manufacturing plants and institutional training centres can provide insights into the use of computer-aided design (CAD), computer-aided manufacturing (CAM), and other automated processes.

Machine Shop Practice

Intermediate Division

(Grades 9 and 10)

Machine shop practice encompasses a number of areas of specialization. These include automotive machine shop work, fitting and bench work, tool and die work, turning, and general machine shop work. Intermediate Division courses in this subject should expose the student to as broad a range of basic techniques as school facilities and time will allow.

Students who plan to enter an apprenticeship to become a general machinist, tool and die maker, or mould maker can benefit from the opportunity to participate in the provincial Linkage program. (Information on this program is available from the directors of the Ministry of Education's regional offices.) Those who plan to continue their studies in this field should be made aware of the various postsecondary technician, technologist, and engineering programs in applied machine shop and of other, related manufacturing, toolmaking, mechanical, metallurgical, and industrial programs.

Courses in machine shop practice are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 8.1.1 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, measurement, hand tools and bench work, lathe machining processes, drill press and operations, and milling machines and operations.

Chart 8.1.1
Core Content for
Machine Shop
Practice
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses		
	<i>Basic</i>	<i>General</i>	<i>Advanced</i>
1. Safety	be	abeg	abcefg
2. Measurement	abcm	abcm	abcegm
3. Manufacturing processes	d	d	bd
4. Layout	ac	ac	abcd
5. Hand tools and bench work	abc	abc	abc
6. Lathe machining processes	a	ab	ab
7. Power sawing	ab	a	a
8. Drill press and operations	ab	ab	ab
10. Grinding	abd	abcd	abcd
11. Milling machines and operations	a	ab	abc
12. Metallurgy	a	aci	achi
15. Oxy-fuel gas welding fundamentals	a	a	a
30. Quality control methods			abc
32. Perspectives on employment	a	ab	abc

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TMS1B for Grade 9 and TMS2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits in the operation of machines and power and hand tools as well as in the handling and storage of materials;
- learn the purposes of the various machines involved in the program and be able to perform basic operations on each of them;
- develop the ability to perform machining operations to a stipulated degree of tolerance;
- develop the ability to read a simple working drawing and produce a finished product;
- acquire a sense of satisfaction in completing a machined project;
- develop the ability to work co-operatively with their peers and supervisors;
- accept advice and instructions from a supervisor;
- acquire knowledge of the occupational opportunities in the machine shop practice trade.

Suggestions for Teachers

To a Grade 9 student, the large, complicated-looking machines used in a machine shop can be quite intimidating. Teachers should be aware that many students are very nervous when operating a lathe or milling machine for the first time. It is important for the teacher to do everything possible to help the student gain confidence and feel comfortable when operating a particular machine.

The machine operations identified in units 5 (hand tools and bench work), 6 (lathe machining processes), 7 (power sawing), 8 (drill press and operations), 10 (grinding), and 11 (milling machines and operations) should be taught gradually and methodically. Speed is not a major concern at this stage; it is far more important for students to gain confidence and to practise the routine steps of various operations on each machine. As the student progresses, he or she can be expected to produce a finished product to a specified degree of tolerance within a stipulated time period.

Teachers should emphasize the machine operation aspect of the trade by discussing the jigs and fixtures used on the various machines. It would also be useful to provide some information about turret lathes and other production machines.

A course offered at the basic level to students who might enter the metal machining field as machine operators must provide them with opportunities to acquire skills and experiences that are basic to the trade. At the same time, students should acquire a grounding in machining theory and should master the basic skills necessary to extend their learning in the subject field.

The evaluation process for students studying machine shop practice at the basic level of difficulty should be an assessment of the practical aspect of their work. When testing students in the theoretical part of the course, it is important to keep the test or quiz short and to deal only with topics related to routine operations. Frequent oral testing can be an excellent way of determining how well the students understand what they are doing. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Safety in a machine shop is very important. Good housekeeping habits will help to prevent accidents. The teacher must demonstrate the correct method of using every machine and piece of equipment that the students are expected to use. The safety rules pertaining

to each machine must be carefully reviewed, and a written copy of these rules must be given to each student. General safety rules involving conduct in the shop must also be

discussed. It is the responsibility of the teacher to see that safety glasses are available for each student and that they are worn when the machines are running.

General Level

Course codes assigned to general level courses planned under this section will be TMS1G for Grade 9 and TMS2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop an increasing awareness of themselves as individuals and of their particular capabilities;
- acquire a general understanding of the various machine operations performed on the lathe, cutoff saw, bandsaw, drill press, horizontal and vertical milling machines, and pedestal, bench, and surface grinders and be

able to perform these operations in a manner that is safe both for themselves and for their fellow workers;

- learn to produce work that is reasonably and consistently accurate to the limits of the measuring devices used and the tolerances established by the teacher;
- learn to use the various bench and layout tools skilfully and safely;
- acquire a basic understanding of metallurgy as it relates to metal machining;
- develop the ability to interpret a reasonably complex working drawing;
- acquire knowledge of careers and further training opportunities in the precision metal machining area and the broader manufacturing field.

Suggestions for Teachers

Courses offered at the general level to students who are considering apprenticeships or other jobs in the metal machining field should provide opportunities to acquire skills and experiences that are fundamental to the machine trades. At the same time, students should acquire a grounding in machining theory and should master the basic skills necessary to extend their learning in the subject field. Students should be informed that technical mathematics, including basic trigonometry and blueprint reading, are essential to further study in this subject area. The use of the sine bar and the performance of helical milling are machining applications in Senior work that reflect this basic requirement.

General level courses should focus on practical activities and operations. Students taking courses at the general level of difficulty should develop reasonable skill in both internal and external measurement with the micrometer and the vernier (unit 2). In addition to developing a reasonable proficiency in the use of the various tools, they will learn to select hacksaw blades, files, and taps and dies (unit 5); they will also learn about machine thread cutting (unit 6). All of the machine operations should be covered; a discussion of the principles of the shaper and of shaping (unit 9) may be included also, as optional content. Students taking these courses should be informed of the apprenticeship requirements in various branches of the metal machining trade, of the

procedures for securing an apprenticeship, of local job opportunities, and of postsecondary programs that offer continuing study in the field.

Courses offered for technical literacy generally provide a survey of the subject field with less emphasis on skill development. Courses of this type should include, in addition to the core content outlined above, a thorough treatment of units 3 ("Manufacturing processes") and 5 ("Hand tools and bench work"). Students taking such courses should have ample opportunity to produce projects using machine shop tools and equipment and to obtain insights into the use in manufacturing of the tools, equipment, and principles of the trade.

Machine shop courses at the general level should focus on projects that incorporate the practical activities, operations, and concepts included in the core learning and reflect the specific objectives set by the teacher for the course. The student's project should be assessed at significant stages of development, and the student should know the criteria on which the final mark will be based. Because the project is the means of translating course objectives into practical activity, the projects selected will vary from course to course.

Special safety rules related to specific materials, equipment, procedures, and environmental conditions should be introduced at the appropriate times. Safety procedures should be discussed at the beginning of the course, and students should be made aware of their responsibilities for maintaining safety.

Intermediate Division courses should be exploratory in nature, providing as wide a range of core learning experiences as is possible within the course time allotted. Students taking these courses should acquire a perspective on the metal machining industry as well as on the broader field of manufacturing.

The training profiles for the general machinist trade and for the millwright trades (industrial

and construction), available through the provincial Linkage program, provide clear skill and knowledge objectives. These profiles can be a valuable resource for the teacher who wishes to design Grade 10 courses for partial specialization.

Many parents or members of the community who have specialized knowledge or skills related to machine shop practice are willing to participate in classroom instruction. This participation may take the form of talks, demonstrations, or provision of sample materials or work produced in the trade. Current issues of trade journals may also be introduced.

Students should be evaluated for achievement in both the theoretical and the practical components of this subject. The weighting of the two components will vary depending on the type of course offered. For example, a course at the general level leading to apprenticeship might stress objectives related to understanding of particular theories involved in machine shop practice. These theoretical topics would then receive extra emphasis in evaluations of student achievement. One approach to teaching and evaluating theoretical studies could centre on single pages of information related to each topic. These sheets might take a pictorial or tabular form and cover such topics as safety, cutting speeds, screw thread data, types and operation of cutting tools, milling-cutter operation, and machine lubrication schedules. These information sheets might be used as the basis for learning and testing and then incorporated in the student's personal shop manual. In contrast, a course offered for technical literacy could emphasize proficiency in particular skills, which could be physically demonstrated in short practical tests.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TMS1A for Grade 9 and TMS2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards critically evaluating the results of their own work and a desire to continually improve;
- enhance interpersonal, co-operative, and leadership skills;
- develop the ability to do machine work to a stipulated degree of accuracy;
- develop the ability to interpret a working drawing and to plan the steps necessary to produce the finished project;
- develop a positive attitude towards efficient and safe work habits;

- learn the purpose and operation of the machines in the school machine shop;
- develop insight into the place of the metal cutting industries within the manufacturing sector;
- acquire a basic understanding of metallurgy as it relates to metal machining and be able to perform basic heat treatment operations;
- acquire knowledge of careers and further training opportunities in the precision metal machining area and the broader manufacturing field.

Suggestions for Teachers

Teachers planning courses at the advanced level of difficulty should refer to the suggestions for teachers in the preceding sections for basic and general level courses in this subject. Most of the suggestions in these sections can be adapted to the planning of advanced level courses.

Students studying machine shop practice at the advanced level of difficulty should be involved in the more theoretical and detailed aspects of the subject. They should develop the ability to operate the machines normally used by students at the Intermediate level and also be able to do some basic calculations involving speeds and feeds. If they make the same project as students in the general level program, the levels of tolerance might be slightly closer. Experiments in metallurgy should be included in the program, and students should be expected to write short technical reports.

An assignment involving research into a specific topic associated with the metal cutting industry should be included in the course.

Students studying at this level of difficulty are often interested in careers in the semiprofessional and professional occupations. It is important, therefore, to identify the full range of occupational opportunities in the metal cutting industry and to provide as much information as possible about these occupations and about related occupations in which knowledge and skills developed in this course would be helpful.

CNC (computer numerical control) machining is a topic that may be discussed. If possible, interested students should have the opportunity to produce a simple program and have it run on a CNC machine.

Machine Shop Practice

Senior Division

(Grades 11 and 12)

Courses in machine shop practice may be offered in the Senior Division in one or more of three specialty areas: general machinist, millwright, and mechanical technology. The courses may vary in time allotment and offer credit for up to 330 hours of in-school work each year. Planning for courses in any of the three specialty areas will continue to be based on the curriculum guideline *Elements of Mechanical Technology, Senior Division, 1970*.

General machinist. Courses in this subject area may be offered in Senior Division at basic, general, and advanced levels of difficulty. The training profile for general machinist, available through the provincial Linkage program, is a useful resource for all Senior Division courses in this subject area. It also provides a common base for the related trade areas of tool and die maker and mould maker. Any terminal performance objectives outlined in the training profile for the introductory (basic) apprenticeship course in general machinist may be included in courses planned for this subject area. The training profile and information on the Linkage program are available from the directors of the regional offices of the Ministry of Education. Courses in this subject area will have the three letters TMS as the stem of their course code.

Millwright. Courses in this area of specialization may be offered in Senior Division at general and advanced levels of difficulty. The training profiles for construction millwright

and industrial mechanic (millwright), available through the provincial Linkage program, are useful resources for Senior Division courses in this area of specialization. Any terminal performance objectives outlined in these training profiles for the basic apprenticeship course may be included in courses planned for the Senior Division. The training profiles and information on the Linkage program are available from the directors of the regional offices of the Ministry of Education. All courses in this subject specialty will have the three letters TMM as the stem of their course code.

Mechanical technology. Courses in this subject area may be offered at general and advanced levels of difficulty. These courses should provide the skills and knowledge needed in general machining and related information about treatment and properties of metals. In addition, the courses should provide insight into the overall manufacturing process, including the role of mechanical drafting and design. Students should be prepared for further training in both postsecondary institutions and the industry. Courses in this subject area will have the three letters TMY as the stem of their course code.

Sheet Metal Practice

Intermediate Division

(Grades 9 and 10)

Sheet metal practice is closely related to other subjects in the manufacturing grouping and to subjects in the construction grouping. Students taking courses based on this section will acquire skills and knowledge related to the fabrication, installation, and repair of sheet metal products. In the process, they will be introduced to the construction trade of sheet metal worker and to the equivalent industrial trade of sheet metal worker (plant), the latter often involving work with heavier metal materials, machines, and equipment and including welding. Objectives related to industrial metal fabrication may be included in these courses where appropriate.

Courses in sheet metal practice are authorized for Grades 9 and 10 at basic, general, and advanced levels of difficulty. Chart 8.1.2

identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety; measurement; layout; hand tools and bench work; shearing, forming, and joining; forming and seaming; and sheet metal developments.

Chart 8.1.2
Core Content for
Sheet Metal Practice
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	Gen/Adv
1. Safety	abcg	abcg
2. Measurement	adn	aden
3. Manufacturing processes	d	ad
4. Layout	d	d
5. Hand tools and bench work	acd	acd
8. Drill press and operations	a	a
10. Grinding	d	bd
12. Metallurgy	b	bch
16. Shearing, forming, and joining	a	ab
17. Forming and seaming	a	a
18. Sheet metal developments	a	ab
32. Perspectives on employment	a	ab

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TMT1B for Grade 9 and TMT2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits when using machinery and power and hand tools and when handling sheet material;
- develop the basic skills of the sheet metal trade, the confidence to use those skills, and the motivation to attempt new sheet metal work tasks;
- improve communication skills and learn the vocabulary associated with the sheet metal industry;
- develop a co-operative attitude towards working with their peers and supervisors;
- acquire the ability to produce a simple sheet metal development drawing;
- develop the ability to produce a sheet metal project to a stipulated degree of accuracy;
- gain a general knowledge of the occupational opportunities in the sheet metal industry.

Suggestions for Teachers

The optional topics chosen should relate closely to the objectives that have been identified for the course. The depth of treatment of both the core and the optional content should suit the ability of the students and the facilities that are available for the program.

Courses in sheet metal practice or metal fabrication offered at the basic level of difficulty require a fairly intensive development of the practical skills covered in units 16 ("Shearing, forming, and joining") and 17 ("Forming and seaming"). Topics, projects, and problems involving mathematics and increasingly complex layouts should be offered as soon as students are ready for them. However, care should be taken to avoid frustrating students by presenting such material before they have been given the necessary background. Courses at the basic level should emphasize the fabrication and assembly aspects of the trade. For example, students should have the opportunity to develop the practical skills and knowledge necessary for simple production line and assembly projects.

Practical projects should serve as themes for courses in sheet metal practice. Students can learn the interrelationships among the skills, concepts, and facts presented in the course by

applying them to the construction of an appropriate project. A variety of projects may be chosen for this purpose. However, since warm air heating and ventilation systems comprise a large part of the metal fabrication industry, it is suggested that practical projects selected for the course focus on these systems. Optional topics can be chosen for their suitability to the chosen project. Some project work should involve parallel-line and simple triangulation methods.

Special safety rules related to specific materials, equipment, procedures, and environmental conditions should be introduced when the appropriate circumstances arise. General safety procedures in the sheet metal shop and the responsibility of every student in this regard should be discussed at the beginning of the course and closely followed.

Basic level courses under this section may be effectively offered in a metal fabrication shop and may emphasize the trade of sheet metal worker (plant). Where limited facilities in the shop restrict opportunities to introduce heavy metal fabrication or plate work, these can be introduced through discussion and through outside resources. Visits to plate, stamping, and heavy metal fabrication shops in the community will help students become aware of

employment possibilities in this type of metal work. In addition, parents and members of the community who have specialized knowledge or skills related to sheet metal practice are often willing to participate in the classroom and can introduce many of the special applications of sheet metal practice to the students through products, audio-visual materials, and talks.

Student evaluation at the basic level should be based mainly on the practical aspect of the program. Students studying at this level often have difficulty with both reading and writing.

While it is important that these skills be improved, it is equally important that the progress of the students be accurately assessed. Reading and writing assignments should be structured as part of the course and, where appropriate, coupled with the students' English program. Tests and exams should make extensive use of diagrams and questions that require short answers. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to general level courses planned under this section will be TMT1G for Grade 9 and TMT2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- gain general knowledge and skill in the basic sheet metal bending and forming operations;
- learn to use the tools and machines commonly associated with sheet metal work with skill and in a manner that is safe for both themselves and their fellow workers;

- produce work that is reasonably and consistently accurate to the tolerance established by the teacher;
- be introduced to the basics of metallurgy as they relate to sheet metal work;
- develop, through the study of sheet metal operations and processes, an understanding of the basic physical principles involved and gain insights into the application of these principles in manufacturing processes;
- acquire knowledge of careers and further training opportunities in sheet metal practice and related fields.

Suggestions for Teachers

Grade 9 courses should be exploratory in nature, providing as wide a range of core learning experiences as possible within the course time allotted. Students taking these courses should acquire some perspective on the sheet metal trades as well as on the broader field of manufacturing that is related to metal fabrication.

A course offered at the general level of difficulty to students who plan to enter apprenticeship in the metal fabrication field must provide

opportunities to acquire skills that are basic to the trade. At the same time, the course should offer a grounding in theory. Students should also be informed that competence in technical mathematics and blueprint reading is necessary for further study in this subject area.

Students taking courses at the general level of difficulty can be expected to achieve reasonable competence in all of the core content areas. They will learn about safety on the job

site (unit 1); develop skill and accuracy in measurement and in the calculation of bend allowances (unit 2); develop skill and accuracy in radial-line developments (unit 4); and, in addition to developing reasonable proficiency in the use of the various tools, acquire knowledge of hacksaw-blade selection, file selection, and the selection and application of sheet metal fasteners (unit 5). Units 16 ("Shearing, forming, and joining"), 17 ("Forming and seaming"), and 18 ("Sheet metal developments") should be covered fairly completely, with a view to developing full understanding and abilities in these areas. Students taking this course should also be informed of the apprenticeship requirements in the sheet metal trades, of the procedure for securing an apprenticeship, of local job opportunities, and of postsecondary programs that offer continuing study in the field.

Courses for students interested in technical literacy should provide a survey of the subject field and place less emphasis on skill development. In addition to the core content outlined above, such courses can include a treatment of the topics identified in units 3 ("Manufacturing processes") and 12 ("Metallurgy") listed under "Course Content for the Manufacturing Grouping" (starting on page 34). Students taking such courses should have ample opportunity to produce projects using sheet metal tools and equipment. In working on their projects, they should gain insights into the application to manufacturing of the tools, equipment, materials, and principles of the sheet metal trade. Discussions should deal as well with other materials used in product fabrication.

Practical projects can serve as themes for courses in sheet metal practice. Students can learn the interrelationships among the skills, concepts, and facts presented in the course by applying them to the construction of a theme project that may involve several component projects. Many different products could be chosen for this purpose. Since warm air heating, air conditioning, and ventilation systems comprise a large part of the metal fabrication industry, practical projects selected for the

course could focus on these systems. If time permits, optional topics to support this theme may be selected from the heating, refrigeration, and air conditioning subject content in the construction grouping.

Another theme could be the metal products that might be produced for the market by a small manufacturing concern. Optional topics could be identified on the basis of the products chosen for this project. Project work should, in any case, involve parallel-line and simple triangulation methods.

Safety must always be stressed, both in the use of machines and tools and in the handling of sheet material. Protective clothing and equipment should be made available to the students when they are performing tasks that require such items.

Limitations in the facilities may restrict the opportunities to introduce heavy metal fabrication or plate work. However, these can be introduced through discussion and through outside resources. Visits to plate, stamping, and heavy metal fabrication shops in the community can help students develop some awareness of the processes involved in this type of metal work. In addition, parents and members of the community who have specialized knowledge or skills related to sheet metal practice are often willing to participate in the classroom and can introduce to the students many of the special applications of sheet metal practice.

The evaluation of student achievement should be based equally on the theoretical and practical components of this subject, unless the course emphasizes one of the components. For example, a course leading to apprenticeship might at times stress objectives related to the theory behind sheet metal practice; this aspect would then be emphasized in evaluation as well. In courses planned to relate to another subject specialty or to develop skills for personal use, the emphasis in evaluation might be on proficiency in particular skills that can be physically demonstrated.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TMT1A for Grade 9 and TMT2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop skills in producing surface development drawings through triangulation;
- acquire background knowledge of technological features represented on typical blueprints involving sheet metal developments;
- develop the ability to plan a reasonably complex sheet metal project;
- relate mathematics and scientific principles to the technology represented in the fabrication of sheet metal products;

- acquire and improve skills in researching technological areas and communicating the acquired information through written reports and oral presentations;
- acquire an overview of occupations in the sheet metal industry and insights into the relationship of the learning to broader career fields.

Suggestions for Teachers

The core content for courses in sheet metal at the advanced level of difficulty is the same as for courses at the general level. This content is specified in chart 8.1.2. Students studying at the advanced level of difficulty can be expected to deal with the content in greater theoretical depth. Courses should be planned to focus on design considerations and problem-solving tasks to a greater extent than is normal in general level courses. This difference in focus should be reflected in the objectives for the course.

Where time permits, optional content may be selected from other subjects within the manufacturing grouping or from related subjects such as drafting or heating, refrigeration, and air conditioning. The optional content in each case should be selected to fit learning objectives planned for the course or particular

themes selected as teaching strategies. In all cases, the content should reflect the ability and interests of the students who take their courses at the advanced level of difficulty.

Students taking their courses at this level may undertake some of these topics as independent study, particularly in bi-level courses, where advanced level may be differentiated from the general level through the use of enrichment topics, themes, and special task assignments and projects. Technical-report writing on various sheet metal topics should be included in the course.

Sheet Metal Practice

Senior Division

(Grades 11 and 12)

Courses in sheet metal practice for Grades 11 and 12 may be offered at the basic, general, and advanced levels of difficulty. Planning for these courses will continue to be based on the Grade 11 and Grade 12 components of the guideline *Technical Subjects RP-27, 1963: Sheet Metal Practice*.

The courses may vary in time allotment and offer credit for up to 330 hours of in-school work each year. Courses in this subject area will have the three letters TMT as the stem of their course code.

Welding

Intermediate Division

(Grades 9 and 10)

Welding can be related both to the construction and to the manufacturing subject groupings. Workers in this trade weld metal parts together according to layouts, blueprints, or work orders, using oxy-fuel gas welding and electric arc welding. The metal-work skills of flame cutting and grinding are also applied in this trade. Fitters and fitter welders utilize these welding skills as a major part of their work.

Students should be made aware of the post-secondary programs for engineering technicians and technologists in this field that are offered at the colleges of applied arts and technology. This additional training can facilitate students' future advancement into supervisory positions or provide the expertise they will need to start their own businesses.

Students taking courses based on this subject will be introduced to oxy-fuel gas welding and cutting, electric arc welding, grinding, and metallurgy.

Courses in welding practice are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 8.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division welding courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, measurement, layout, hand tools and bench work, grinding, arc welding fundamentals, and oxy-fuel gas welding fundamentals.

Chart 8.1.3
Core Content for
Welding
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	abcdeg	abcdeg
2. Measurement	ahik	abcdhijk
3. Manufacturing processes	d	ad
4. Layout	c	c
5. Hand tools and bench work	ac	ac
10. Grinding	adfg	adfg
12. Metallurgy	cgi	cdghi
13. Welding equipment	ab	ab
14. Arc welding fundamentals	ab	ab
15. Oxy-fuel gas welding fundamentals	ab	abc
25. Ornamental metal work	a	ab
29. Bonding of plastics		a
30. Quality control methods	ac	abc
32. Perspectives on employment	a	ab

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TMW1B for Grade 9 and TMW2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop good work habits and a sense of satisfaction in completing a welding operation or project in an orderly fashion;
- acquire a general knowledge of how to adjust and operate both oxy-fuel gas welding and cutting equipment and electric arc welding equipment;
- learn to use the basic tools associated with the welding trade;
- develop the habits necessary for safe, efficient welding operations;

- develop the ability to produce a proper weld with a limited degree of distortion;
- develop the ability and confidence to produce a welding project with little or no supervision;
- develop the ability to recognize the characteristics of the metal and its flow when making a weld;
- acquire knowledge of careers and further training opportunities in welding and related trades.

Suggestions for Teachers

Grade 9 courses should be exploratory in nature. There is a great diversity in applications of welding to the construction and manufacturing fields; in most communities students can be made aware of this through field trips, lectures or talks by experts, films, and special demonstrations. By these means students can also learn about employment and further training opportunities in this field.

Safety must be treated as an integral part of the welding program. Every operation should be properly demonstrated by the teacher, and all the safety rules governing the particular operation must be emphasized. Good house-keeping habits will produce a neat, attractive shop and, more important, a safe shop. Welding teachers must ensure that the shop is properly ventilated and that it is equipped to handle arc radiation.

The choice of optional topics should follow closely the objectives that have been identified for the course. The depth of treatment of both the core and the optional content should reflect the ability of the students, the type of course that is being offered, and the facilities that are available for the program. Blueprint reading should be an element of at least one project in the course.

Courses in welding offered at the basic level of difficulty require a fairly intensive treatment of the practical skills covered in units 14 ("Arc welding fundamentals") and 15 ("Oxy-fuel gas welding fundamentals"). Topics, projects, and problems involving mathematics and metallurgy should be offered to the students when they are ready for them. However, care should be taken to avoid frustrating students by presenting such material before they have the background they need to handle it. Courses at the basic level should emphasize the development of basic welding techniques and assembly so that students have the maximum opportunity to develop the necessary practical skills. Special emphasis should also be given to welding and safety on the job site.

Welding courses can offer students a wide range of interesting projects. Teachers should identify the skills and knowledge that are to be included in the course and then allow students to make their selection from a variety of appropriate projects. In some cases, a mass-produced project can generate a great deal of interest. Such projects can involve the entire class in planning the various stages of development. Simple jigs and fixtures can be created and used at the work stations. Students who later decide to work as welders may

be involved in some form of mass production. A project involving a mass-produced product, therefore, will expose students to a situation they can expect to experience in industry.

The assessment of student achievement at the basic level of difficulty should focus primarily on the practical aspect of the program. Approaches to assessing progress such as watching a student produce a proper weld or asking

a few pertinent questions regarding the task the student is attempting are often the best way to determine how well the student has learned the lessons that have been presented. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

General Level

Course codes assigned to general level courses planned under this section will be TMW1G for Grade 9 and TMW2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- understand and be able to adjust and use the various oxy-fuel gases and electric arc welding machines and equipment in a manner that is safe both for themselves and for their fellow workers;

- learn to produce welds that are sound and that have a minimum of distortion;
- learn to use the various hand and power tools of the welding trade skilfully and safely;
- be introduced to the basics of metallurgy as they relate to welding;
- develop an understanding of the physical principles involved in welding and gain insights into the applications of these principles in manufacturing processes;
- acquire knowledge of careers and further training opportunities in welding and related fields.

Suggestions for Teachers

Teachers planning courses at the general level should refer to the suggestions for teachers in the preceding section for basic level courses. In most cases, the comments and suggestions can be readily adapted to the planning of general level courses.

A course offered at the general level of difficulty to students who plan to enter apprenticeship in the welding field must provide them with opportunities to acquire skills and experiences that are basic to the trade. Students should acquire a grounding in the theory of the subject and master the basic skills necessary to extend their learning in the subject field.

Students taking courses at the general level of difficulty can be expected to achieve reasonable competence in all of the core content areas. They will learn about safety on the job site, handling and use of pressurized and inflammable gases, fire control, and eye and skin protection from radiation burns (unit 1). The effects of the expansion and contraction of metal on the accuracy of measurement should be discussed (unit 2), and unit 12 should be covered fairly comprehensively, with special emphasis given to the various effects of heating metals to high temperatures and the effects of the introduction of impurities into welds. Units 13 ("Welding equipment"), 14 ("Arc welding fundamentals"), and 15 ("Oxy-fuel gas welding fundamentals") should be covered with a view to helping

students develop both knowledge and skill in these areas. Students taking this course should also be informed of the apprenticeship requirements in the welding trades, of the procedure for securing an apprenticeship, of local job opportunities, and of postsecondary programs that offer continuing study in the field.

Courses for students interested in technical literacy should provide a survey of the subject field and place less emphasis on skill development. Unit 12 should be covered, with special emphasis on the molecular changes that take place when metals are subjected to high temperatures. Courses of this type should include, in addition to the core content, a thorough treatment of unit 3 ("Manufacturing processes"). Students taking such courses should have ample opportunity to produce objects using welding tools and equipment and to obtain insights into the application to manufacturing of the materials, tools, equipment, and principles of the trade. Some instruction and discussion should deal with the use of welding in assembly lines.

Practical projects should serve as themes for all courses based on this section. Students can learn the interrelationships among the skills, concepts, and facts presented in the course by

applying them to the construction of an appropriate project. A variety of projects can be chosen for this purpose – some requiring student input to the design, others requiring blueprint reading. Optional topics can be selected for their suitability to the chosen project. Projects that are functional and that the student can take home serve to increase student enthusiasm and interest. Practical work should involve metal fabrication because of the importance of welding in this industry.

The evaluation of student achievement should be based equally on the theoretical and practical components of this subject. For example, there should be some assessment of both ability to do assembly work and knowledge of the metallurgy fundamentals that may be involved.

Welding

Senior Division

(Grades 11 and 12)

Courses in welding for Senior Division may be offered at the basic and general levels of difficulty. Planning for these courses will continue to be based on the Grade 11 and Grade 12 components of the guideline *Technical Subjects RP-27, 1963: Welding*.

The courses may vary in time allotment, offering credit for up to 330 hours of in-school work each year. Courses in this subject area will have the three letters TMW as the stem of their course code.

Work experience and co-operative education can provide excellent opportunities for students to gain practical experience and knowledge

about employment in the welding industry. Exposure to the productive atmosphere generated in an industrial shop, opportunities to work with experienced, mature tradespeople, and opportunities to gain practical experience on a variety of industrial equipment are all good reasons for organizing an out-of-school course component for students studying welding.

Foundry Practice

Intermediate Division

(Grades 9 and 10)

Foundry practice involves producing objects economically and efficiently by pouring molten material into a cavity or mould and allowing it to solidify. The various processes involved in this practice can facilitate the manufacture of parts that are intricately shaped or extremely large. Foundry practice can be related to the other subjects in the manufacturing grouping, to drafting and blueprint reading in the graphics grouping (the elements of casting design), and to woodwork in the construction grouping (aspects of pattern making).

Courses in foundry practice can provide students with a perspective on how the metallurgical aspects of casting, mould processes, foundry technology (e.g., melting and pouring), and design technology (including the design of pattern equipment to facilitate the moulding process) relate to the production of a solid casting of desired shape.

Courses in foundry practice are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 8.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in foundry practice may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, measurement, hand tools and bench work, metallurgy, foundry equipment, moulding, and casting.

Chart 8.1.4
Core Content for
Foundry Practice
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
1. Safety	abcf	abcf
2. Measurement	acfj	acfj
3. Manufacturing processes		ac
5. Hand tools and bench work	a	a
10. Grinding	ad	abdg
12. Metallurgy	cdfgi	cdfighi
19. Foundry equipment	a	a
20. Moulding	a	ab
21. Casting	a	ab
32. Perspectives on employment	a	ab

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TMF1B for Grade 9 and TMF2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to work safely and competently with machines, tools, and materials involved in foundry practice;
- understand the routines of foundry practice;
- develop the confidence to perform, on their own initiative, the tasks related to foundry practice;
- develop the ability to understand both oral and written instructions in the vocabulary used in foundry practice;
- acquire the ability to produce a casting to a stipulated degree of accuracy;
- learn some of the basic concepts of metallurgy related to the casting of metal;
- acquire the ability to read a working drawing of a machine part that is to be cast;
- learn how to work co-operatively with peers and supervisors;
- acquire insight into the occupational opportunities available in the metal casting and foundry industry.

Suggestions for Teachers

An orderly and neat foundry shop will help create a safe environment for students and may also influence positively their views regarding good housekeeping habits. Teachers should see that proper safety equipment and clothing are available and used when students are working. Proper ventilation is very important in a foundry shop. Dust and toxic fumes must be exhausted, and proper lighting should be available at the worksite.

A course offered at the basic level of difficulty to students who are considering employment in the metal casting trade must provide them with opportunities to acquire skills and experiences that are basic to the trade.

Students taking courses at the basic level of difficulty can be expected to achieve reasonable competence in all of the core content areas. Special emphasis should be placed on the safety practices required in the handling and pouring of molten metals (unit 1). There should be some discussion of the allowances for shrinkage (unit 2). Consideration should be given to conventional hand and bench tools, in addition to the specialized hand tools used in the metal-casting process (unit 5). The practical work in the course should focus on the development of the skills and knowledge identified in units 19 ("Foundry equipment"),

20 ("Moulding"), and 21 ("Casting"). Students should be informed of current employment opportunities in foundry and related fields. They should also be made aware of the value of foundry skills and knowledge to individuals entering other fields of manufacturing and design.

The basic level courses in foundry practice should emphasize practical experience in moulding, casting, melting, pouring, and basic metallurgy. Most procedures should be introduced by demonstrations. Safe practices should be reviewed and students required to demonstrate competence in each new procedure.

The optional topics chosen should relate closely to the objectives that have been identified for the course. The depth of treatment of the core and any additional content that may be selected for particular projects should suit the ability of the students and the facilities that are available for the program.

The methods of evaluating student work and compiling marks should be very clearly presented to the students. The evaluation of student achievement should be weighted towards the practical (i.e., approximately 25 per cent for the theoretical component and 75 per cent for the practical component of the course).

Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

When planning courses in foundry practice, teachers should consider these suggestions and comments:

- The construction, use, and care of tools and equipment may be taught using packages of information that are applicable to the particular use the items are to be put to. Using each item appropriately for the particular task should be the objective in each case.
- Melting and pouring wax is a safe and effective way of demonstrating the casting process before pouring molten metals.
- When discussing allowance for shrinkage, it is useful to compare the physical expansions of particular metals when they are heated with the expansion of water when it is heated.
- Good-quality moulding sand should be used so that students can be assured of a successful mould each time. Oil-bonded sand is very effective for this purpose.
- Projects should be simple in shape so that moulding can be accomplished in one period. In basic level courses, many students lose interest if the project carries over to two or three periods.
- Students should have the opportunity to make the pattern they will mould. A better understanding of the purpose of the pattern is achieved by students who are involved in the full pattern-to-mould procedure.
- At least one project that comprises three or four castings (such as a small cannon) should be part of the course. Such projects, which students can take home and show to their peers, provide a sense of achievement and satisfaction. Matchplates are most suitable for this type of project.
- Students should be made aware of the positive relationship between good work habits and successful employment. They need continual encouragement to develop good work habits such as regular attendance and punctuality. Good housekeeping, conscientious shop organization, and the proper care of tools and equipment should be continuing objectives of the course.

General Level

Course codes assigned to general level courses planned under this section will be TMF1G for Grade 9 and TMF2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- develop an increasing awareness of themselves as individuals and of their particular capabilities;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- understand and learn to perform various operations involved in the casting of metals in a manner that is safe both for themselves and for their fellow workers;
- become familiar with the tools and equipment used in the foundry and be able to use them skilfully and safely;
- learn to produce castings that are sound and accurate to the tolerances established by the teacher;
- be introduced to the basic metallurgical aspects of casting and melting furnace operation;
- develop, through the study of techniques and processes in foundry practice, an understanding of the basic principles and their application in manufacturing processes;
- acquire knowledge of careers and further training opportunities in metal casting, foundry, and related fields.

Suggestions for Teachers

Teachers planning courses at the general level should refer to the suggestions for teachers in the preceding section for basic level courses. Many of the comments and suggestions for planning basic level courses in foundry practice can be adapted to the planning of general level courses in this subject.

Students should acquire a grounding in the theory of metal casting and should master the skills necessary to extend their learning in the field of foundry practice.

Students taking courses at the general level of difficulty can be expected to achieve reasonable competence in all of the core content areas. Special emphasis should be placed on the safety practices involved in the handling and pouring of molten metals (unit 1). There should be some discussion of the allowances for shrinkage (unit 2), as well as of machine casting and the selection of casting metals to facilitate manufacture and production (unit 3). Teachers should present conventional hand and bench tools in addition to the specialized hand tools used in the metal-casting process (unit 5). The practical work in the course should focus on the development of the skills and knowledge identified in units 19, 20, and 21. Students should be informed of employment opportunities and of postsecondary

programs that offer continuing study in this field. It is important to show students that knowledge of foundry practice is useful in many other industrial fields.

Evaluation of student achievement should be based approximately 40 per cent on the theoretical and 60 per cent on the practical component of the subject. Some assessment should be made of the quality of the casting with respect to defects and flaws. Some assessment should also be made of the student's knowledge of the fundamentals of metallurgy that may be involved.

When the required minimum of project work planned for the general level course is accomplished by the student, "bonus" projects may be offered to create interest, motivation, and opportunities for design input. Examples of such projects are ash trays, wall plaques, house numbers, candle holders, name plates, and paper weights.

Foundry Practice

Senior Division

(Grades 11 and 12)

Courses in foundry practice for the Senior Division may be offered at the basic and general levels of difficulty. Planning for these courses will continue to be based on the Grade 11 and Grade 12 components of the guidelines *Technical Subjects RP-27, 1963; Woodworking—Pattern and Casting Processes and Elements of Mechanical Technology S.27D, 1968*. In addition, teachers may include optional topics of their own choice that are appropriate to Senior Division course objectives in foundry practice.

The courses may vary in time allotment, offering credit for up to 330 hours of in-school work each year. Courses in this subject area will have the three letters TMF as the stem of their course code.

Power Transmission and Control

Intermediate Division (Grades 9 and 10)

Computer-aided manufacturing (CAM), coupled with computer-aided design (CAD), is revolutionizing the world of production. These systems are being applied not only to existing and rapidly changing technologies but also to new technologies.

Power transmission and control is an important aspect of the manufacturing process. Intermediate Division courses offered in this subject introduce students to the basic circuits and control devices involved in hydraulic, pneumatic, electromagnetic, and mechanical systems. These courses can also provide a variety of problem-solving, trouble-shooting, and design experiences related to other subjects in this grouping. All courses in this subject should appeal to students interested in engineering and the application of scientific principles and technology to the products and processes of manufacturing.

Students taking these courses should be made aware of the postsecondary programs for engineering technicians and technologists in fluid power and related subjects offered at the colleges of applied arts and technology. Competence in mathematics, science, and communications is essential to student success on

such a career path. Students can improve their skills in these areas as they investigate the various practical applications of power transmission and control.

Courses in power transmission and control are authorized for Grades 9 and 10 at the general and advanced levels of difficulty. Chart 8.1.5 identifies the core content for these courses. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, measurement, hydraulics, pneumatics, and instrumentation.

Chart 8.1.5
Core Content for
Power Transmission
and Control
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	General	Advanced
1. Safety	abcdg	abcdg
2. Measurement	acgh	acgh
3. Manufacturing processes	bc	bc
5. Hand tools and bench work	abc	abc
12. Metallurgy	bgh	acdgh
13. Welding equipment		a
14. Arc welding fundamentals		a
15. Oxy-fuel gas welding fundamentals		a
22. Hydraulics	a	ab
23. Pneumatics	a	ab

Content Units**Core Content for Courses**

	<i>General</i>	<i>Advanced</i>
24. Instrumentation	a	ab
32. Perspectives on employment	ab	abc
33. Computers and interfacing principles		a
34. Mechanical power transmission		a

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

General Level

Course codes assigned to general level courses planned under this section will be TMC1G for Grade 9 and TMC2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop the ability to work co-operatively with peers and supervisors;
- develop sufficient confidence to perform a task on their own initiative;
- acquire the ability to analyse critically a completed project and the willingness to make changes if necessary;
- learn to work with pressurized circuitry in a manner that is safe both for themselves and for their fellow workers;
- develop a general understanding of the function and operating principles of the components of typical hydraulic and pneumatic circuits that control and actuate machinery and equipment;
- learn to handle skilfully and safely the variety of hand and bench tools commonly used in the installation, service, and repair of power transmission and control systems;
- acquire an understanding of the physical principles and technology (mechanics, properties of materials, and electrical/electronic circuitry) related to the instrumentation of power transmission and control systems;
- gain insights into the application of power transmission and control systems to manufacturing processes;
- learn about careers and further training opportunities in the various fields associated with power transmission and control.

Suggestions for Teachers

The choice of optional topics should suit the objectives and practical experiences planned for courses based on this section. Two areas of content that are reflected in the aims but not in the core content are electricity/electronics and mechanics. Optional topics such as series and parallel electrical circuits and electro-magnetism as applied to electrical control, which may be appropriate to an understanding of particular applications, can be selected from the electrical grouping.

Topics in mechanics that can be closely related to practical experiences in the course may be selected from unit 31 of this subject grouping. The depth of treatment of both the core and the optional content should reflect the ability of the students, the type of course that is being offered, and the facilities that are available for the program.

Students taking these courses with the goal of entering employment as apprentice millwrights or maintenance mechanics should have the

opportunity to experience and acquire the skills and knowledge that are basic to these trades and that will facilitate the continuation of their training. Safety on the job site and in procedures for repairing machinery (unit 1) should receive priority. Students need to develop skill and accuracy in making precision measurements and the related calculations for the various physical quantities involved in each machinery or system application (unit 2). Knowledge of assembly processes and of the use of various circuit control devices (unit 3), understanding of metallurgy (unit 12), and reasonable proficiency in the selection and use of the various tools required for dismantling and assembling machinery (unit 5) should also be acquired. Ideally, students with apprenticeship goals in these areas should also experience related training in machine shop and welding. A training profile that outlines the provincial curriculum for the millwright trade and that can provide guidance in the planning of these courses is available through the Linkage program. Information on this program is available from the directors of the regional offices of the Ministry of Education.

Students taking a course based on this section with the goal of continuing to a postsecondary diploma program should be able to acquire a comprehensive overview of this subject field with a reduced emphasis on the development of particular skills.

Some students may have a primary interest in hydraulics, others in instrumentation, and still others in mechanical technology or engineering. All should be able to acquire some familiarity with manufacturing processes as well as some understanding of the design aspects of power transmission and control of machinery and equipment. Students should have ample opportunity to design and implement projects in their areas of major interest. This practical activity may be of two types. The first involves solving problems by using models or breadboard techniques. The second type of activity involves trouble-shooting of equipment containing various circuits. A high proportion of student time should be spent on practical activities.

The Grade 9 course should be exploratory in nature. A variety of components and circuit units should be available so that various types of circuits and systems can be set up. These should be supplemented with working pieces of equipment or machinery containing a variety of circuits. Examination of special hydraulically, pneumatically, or electronically controlled equipment, available in other shops at the school or at local manufacturing plants, can provide a valuable additional source of information and experience.

Special safety rules related to specific materials, equipment, procedures, and environmental conditions should be introduced when the appropriate circumstances arise. General safety procedures in the shop and the responsibility of every student to observe them should be discussed at the beginning of the course and closely followed.

Emphasis in the evaluation of student progress will vary with the type of course and will reflect course objectives. In courses that meet the needs of students having postsecondary education goals, assessment should focus on the students' skill and ingenuity in problem solving. Although knowledge of theoretical principles is important, it should not receive the primary emphasis in evaluation of student achievement. In courses planned to meet the needs of students who are proceeding directly to employment, the evaluation of student achievement should be based equally on the theoretical and practical components of the course. Development of students' ability to work in groups should be an objective and an area for assessment in all courses based on this section. Additional suggestions regarding evaluation are discussed in the introduction to this module and on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Advanced Level

Course codes assigned to advanced level courses planned under this section will be TMS1A for Grade 9 and TMS2A for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop an increasing awareness of themselves as individuals and of their particular capabilities;
- develop an understanding of the fundamentals of fluid mechanics in static and dynamic systems;
- develop an understanding of the basic principles of hydraulic and pneumatic systems, particularly in manufacturing and mobile settings;
- learn safe procedures for working with high-pressure liquids as well as lower-pressure air systems;
- learn the proper use of basic hand and bench tools and of equipment used to install, service, and test fluid power systems and their related components;
- acquire a knowledge of fluid power terminology;
- develop an understanding of fluid power symbols and their use in interpreting, planning, and servicing primary systems;
- acquire an understanding of the physical principles and technology (electrical/electronic circuitry, mechanics, materials, computer logic, basic interfacing techniques, and three-buss computer architecture) related to power transmission and control systems;
- investigate computer-aided manufacturing, including applications of robotics in industry;
- learn how a surveyor's transit is used for machine layout, alignment, and set-up;
- investigate educational requirements for careers in manufacturing, technology, and engineering, with an emphasis on college and university programs.

Suggestions for Teachers

Introductory insights into topics such as series and parallel electrical circuits, logics and logic circuits, Boolean algebra, and integrated circuits should be considered important parts of these courses. In addition, electromagnetism, solenoids, and relays should be introduced. These topics may come from the electrical grouping. Mechanics may be investigated through topics listed in unit 31 of this module. The depth of treatment of both core and additional content should reflect the abilities of the students, the objectives of the course, and the facilities and equipment available. The multidisciplinary nature of the content makes these courses very suitable to team teaching.

Students taking courses based on this section should have demonstrated mathematical ability and an active interest in science. Courses at this level are directed towards students who plan to attend college or university. Emphasis should be placed more on why than on how. Students should gain some appreciation of the history and evolution of technology and engineering as reflected in manufacturing.

Safety must be stressed not only in the mechanical areas but in the electrical as well. Fluids and gases under pressure impose additional risks.

Hydraulic principles – force, pressure, area, mechanical advantage, and efficiency – can be demonstrated with a hydraulic jacking system. Mathematical calculations can be proved with ease using such a system. A simple hydraulic circuit using a cylinder, a directional control valve, a relief valve, and a source of fluid can be set up to demonstrate control, velocity, pressure, volume, and working force. The same approach can be used in the field of pneumatics.

The materials section should cover stress, strain, elongation, elasticity, and Hooke's law. The application and strength of various types of metal should be considered. The results of a load test on a turned test piece can be compared with the theoretical values calculated mathematically by the students.

The control of fluid power systems is normally handled by means of pressure control valves, directional control valves, and flow control valves. A demonstration using limit switches at the end of the cylinder stroke can be used to illustrate how the principles of automated circuits are applied. A timer can be added to the system to introduce automated electric controls, and a pressure switch may be added to signal a movement.

An elementary approach to computer applications in manufacturing can be made using logic elements, gates, and truth charts. The binary and hexadecimal systems should be introduced to explain machine logic.

A simple gear box system can be used to demonstrate speed and torque ratios and to illustrate how these are governed by the size of fluid power components in a machine system.

These courses should emphasize an analytic, investigative, and design approach to the subject matter. The practical and theoretical portions of the program should be mutually reinforcing.

Industrial Control – Power and Processes

Senior Division

(Grades 11 and 12)

Courses in industrial control – power and processes may be offered in the Senior Division at general and advanced levels of difficulty. Four types of courses may be offered under this guideline. Three focus on the specialties of hydraulics and pneumatics, instrumentation, and principles of technology, respectively. The fourth can be a combination of any of these three specialties under the general title of industrial control – power and processes. Planning for any of the four types of courses will continue to be based on the guideline *Industrial Physics S. 27C (11-12), 1967*. The courses may vary in time allotment, offering credit for up to 330 hours of in-school work each year.

Courses in hydraulics and pneumatics introduce students to the theory, hardware, and design considerations of fluid power and control applications. An understanding of the physical principles related to electronic/electrical devices commonly used in these circuits is also included. Courses in hydraulics and pneumatics will have the three letters TMH as the stem of their course code.

Courses in instrumentation introduce students to the fundamentals of industrial process control. The focus in these courses is primarily on the sensing, measurement, transmission, analysis, and control of the pressure, level, flow, distance, and temperature associated with various processes and operational systems. Study of a variety of applications of instrumentation facilitates investigation of common thermal, fluidal, mechanical, and

electrical principles rather than specific design characteristics of the hardware involved.

Courses in instrumentation will have the three letters TMI as the stem of their course code.

Courses in principles of technology will introduce students to the technical principles that govern the behaviour of devices used in various technological systems. The physical concepts and principles of force, work, power, rate, momentum, resistance, energy, force transformers, energy converters, transducers, vibrations, time constants, and radiation are investigated in the mechanical, thermal, electrical, and fluidal systems associated with various technologies and trades. Courses in principles of technology will have the three letters TMP as the stem of their course code.

Courses in industrial control – power and processes may be planned to support themes involving any combination of topics from hydraulics and pneumatics, instrumentation, and principles of technology. Courses in industrial control – power and processes will have the three letters TMC as the stem of their course code.

Summary of Core Content for Courses in the Manufacturing Grouping

Chart 8.1.6

Content Units	Machine Shop Practice (Grades 9-10)			Sheet Metal Practice (Grades 9-10)		Welding (Grades 9-10)		Foundry Practice (Grades 9-10)		Power Transmission and Control (Grades 9-10)	
	Basic	Gen	Adv	Basic	Gen/Adv	Basic	General	Basic	General	General	Advanced
1. Safety	be	abeg	abcefg	abcg	abcg	abcdeg	abcdeg	abcf	abcf	abcdg	abcdg
2. Measurement	abcm	abcm	abcmn	adn	aden	ahik	abcdhijk	acfj	acfj	acgh	acgh
3. Manufacturing processes	d	d	bd	d	ad	d	ad		ac	bc	bc
4. Layout	ac	ac	abcd	d	d	c	c				
5. Hand tools and bench work	abc	abc	abc	acd	acd	ac	ac	a	a	abc	abc
6. Lathe machining processes	a	ab	ab								
7. Power sawing	ab	a	a								
8. Drill press and operations	ab	ab	ab	a	a						
9. Shaper operations											
10. Grinding	abdg	abdcg	abcdfg	d	bd	adfg	adfg	ad	abdg		
11. Milling machines and operations	a	ab	abc								
12. Metallurgy	a	aci	achi	b	bch	cdg	cdghi	cdfgi	cdfghi	bgh	acdgh
13. Welding equipment						ab	ab				a
14. Arc welding fundamentals						ab	ab				a
15. Oxy-fuel gas welding fundamentals	a	a	a			ab	abc				a
16. Shearing, forming, and joining				a	ab						
17. Forming and seaming				a	a						
18. Sheet metal developments				a	ab						
19. Foundry equipment								a	a		
20. Moulding								a	ab		
21. Casting								a	ab		
22. Hydraulics										a	ab
23. Pneumatics										a	ab
24. Instrumentation										a	ab
25. Ornamental metal work						a	ab				
26. Rigging											
27. Plastics											
28. Moulding, forming, and laminating of plastics											
29. Bonding of plastics							a				
30. Quality control methods			abc			ac	abc				
31. Mechanics											

Content Units

	Machine Shop Practice (Grades 9-10)			Sheet Metal Practice (Grades 9-10)		Welding (Grades 9-10)		Foundry Practice (Grades 9-10)		Power Transmission and Control (Grades 9-10)	
	<i>Basic</i>	<i>Gen</i>	<i>Adv</i>	<i>Basic</i>	<i>Gen/Adv</i>	<i>Basic</i>	<i>General</i>	<i>Basic</i>	<i>General</i>	<i>General</i>	<i>Advanced</i>
32. Perspectives on employment	a	ab	abc	a	ab	a	ab	a	ab	ab	abc
33. Computers and interfacing principles											a
34. Mechanical power transmission											a
35. CNC machines											

See "Course Content for the Manufacturing Grouping", beginning on page 34, for description of the subunits a, b, c, etc.

Course Content for the Manufacturing Grouping

1. Safety

- a) Accident prevention in the shop; hazards from fumes; first aid procedures;
- b) safety in the use of machines, tools, materials, and equipment;
- c) fire control and escape routes; personal safety; protective clothing, eye protection, risks of jewellery and loose hair; good housekeeping;
- d) accident prevention on the job site;
- e) arc radiation hazards; types and control of gases; gas toxicity;
- f) accident reporting;
- g) fire extinguishers;
- h) control of inflammable fluids; precautions in the use of acids and other chemicals.

2. Measurement

- a) Measurement instruments – use, types, and care; steel rules;
- b) micrometers; external measurement with calipers;
- c) imperial and metric measuring systems;
- d) calculations for linear and circular distances; use of dividers;
- e) geometric figures; use of gauges;
- f) internal and external measurement with calipers;
- g) external measurement with verniers, calipers, and micrometers; internal measurement with calipers, verniers, telescope gauges, and micrometers; measuring devices for pressure, flow, velocity, and volume;
- h) temperature measurement;
- i) expansion and contraction;
- j) shrinkage rules;
- k) allowances, tolerance, and fits;
- l) the transit (for survey work);
- m) use of micrometers;
- n) allowances.

3. Manufacturing processes

- a) History and development of various trade areas; terms;
- b) history and development of various trade, manufacturing, and engineering areas; types and uses of power transmission and control; computerization – CAD/CAM, robotics;
- c) the integration of various trades in the manufacture of products; assembly and production techniques and systems;
- d) apprenticeships; unions.

4. Layout	<ul style="list-style-type: none"> a) Basic layout; preparation of surfaces for layout; location and layout of drill holes and layout lines on flat surfaces; layout of centres on round stock or use of combination square set; b) use of hermaphrodite calipers, combination square sets, parallels, V blocks, angle plates, surface gauges and surface plates, geometric and plain layout methods, pattern development; triangulation; c) basic layout; blueprint reading – welding symbols; d) basic layout and use of scribes, prick and centre punches, trammels, allowances, orthographic planes.
5. Hand tools and bench work	<ul style="list-style-type: none"> a) Layout tools, work-holding devices, cutting tools, forming tools, fastening tools; b) taps, dies, and threading; c) types and uses of various metal fasteners; d) use of bench stakes; soldering irons and soldering.
6. Lathe machining processes	<ul style="list-style-type: none"> a) Lathe operation and safety; selection and setting of speeds and feeds; use of graduated collars; centre drilling; end facing; parallel, shoulder, and taper turning; grooving; knurling; filing and polishing; radiusing and chamfering; b) purposes and techniques for use of various accessories; reaming; thread cutting.
7. Power sawing	<ul style="list-style-type: none"> a) Care and use of various types of saws; safety; cutting off stock; contour sawing; cutting fluids; b) band filing; blade selection.
8. Drill press and operations	<ul style="list-style-type: none"> a) Care and operation; safety; speeds and feeds; clamping and securing work; twist drill identification, selection, and use; drilling a hole to size and layout; b) drilling to a depth; countersinking; counterboring; drilling cylindrical work; jig and fixture use; spotfacing; reaming; cutting fluids.

9. Shaper operations

- a) Various types, sizes, and operating principles; positioning and adjusting stroke length, setting speeds and feeds; shaping a flat surface; shaping a vertical surface; shaping rectangular work. (Note: This optional content should have low priority. In the metal machining industry, shapers have generally been replaced by vertical mills.)

10. Grinding

- a) Operating principles of bench and pedestal grinders;
- b) off-hand grinding;
- c) types, sizes, and operation of surface grinder;
- d) maintenance and safe use of grinders;
- e) magnetic chuck techniques; grinding plain and parallel surfaces;
- f) types and sizes of bench and pedestal grinders;
- g) adjustment of tool rests and eye shields.

11. Milling machines and operations

- a) Milling machine operation and safety; types of horizontal and vertical milling machines; work-holding devices; speed and feed setting; plain milling, milling rectangular work; horizontal and vertical plain milling operations; use of graduated collars;
- b) sizes and maintenance of horizontal and vertical milling machines;
- c) side and end milling; changing cutters and arbors; dividing head use; conventional and climb milling.

12. Metallurgy

- a) Metal identification; hardening, tempering, and case hardening; annealing; basic metal shapes; spark testing;
- b) SAE classification of sheet metal; corrosion resistance;
- c) physical properties of various ferrous and non-ferrous metals;
- d) stress, strain, area, tension, compression, Young's modulus, shear;
- e) alloys, normalizing;
- f) distortion control and shrinking; basic metal shapes;
- g) SAE classification of steel and iron;
- h) manufacture of steel and iron;
- i) forge and furnace operation and safety.

13. Welding equipment	<ul style="list-style-type: none"> a) Air circulation requirements; eye protection; protective clothing; cables; pressure regulators; arc welding machines; spot welders; holders; b) cylinders; torches, manifold systems, reverse flow (check) valves; gases and gas production.
14. Arc welding fundamentals	<ul style="list-style-type: none"> a) Welding circuits and energy sources; adjustment of current and polarity; spot welding; other special resistance welding; b) bead formation – arc length; current setting angle; speed of travel of electrode; weld defects; weaving; starting and stopping arc; joining beads; joint formation – butt, lap, corner edge, and tee joints; preparation, application, and welding of each type; weld testing, welding defects; simple strength tests; electrode and rod selection – classification and selection of various rods and electrodes for welding and brazing mild steel and other metals.
15. Oxy-fuel gas welding fundamentals	<ul style="list-style-type: none"> a) Proper regulator and torch adjustments; types of flames; flashback and backfire; tip selection; b) running lines of fusion with and without filler rod; braze welding; manual and machine oxy-fuel gas cutting – torch-cutting attachments; tip selection; circle cutting; piercing; straight and bevel cuts; cutting faults and problems; c) calculations, layout, and kerf allowances.
16. Shearing, forming, and joining	<ul style="list-style-type: none"> a) Types and uses of shears, adjustable bar folders, standard hand brakes, box and pan brakes, lock roll and slip roll formers; cutting; forming, folds, bends, and rolling; b) punching and notching.
17. Forming and seaming	<ul style="list-style-type: none"> a) Care and use of the lockformer, turning machine, burring machine, grooved seamer, wiring machine, and easy edger; production and application of rolled and grooved seams, double seams, and wired edges.

18. Sheet metal developments

- a) Layout and fabrication of rectangular development from an edge or line;
- b) centre line development for tapered, flat, and rectangular shapes;
- c) parallel line development for cylindrical shapes and intersections;
- d) radial line development for conic taper shapes and intersections;
- e) triangulation development;
- f) seam allowances and assembly techniques;
- g) use of reference edges, lines, and points for accuracy.

19. Foundry equipment

- a) Types and bonds of foundry sands; moulding requirements; patterns, types, and colour schemes; flasks; foundry tools.

20. Moulding

- a) Methods of ramming, cope, and drag; sources of gas and venting a mould; types of moulding – bench, floor, and machines; cores and coremaking;
- b) sand preparation (mixes and bonding), types of cures, cure reinforcing, core coating and pasting, core baking.

21. Casting

- a) Furnace types and uses; alloys; melting and pouring temperatures; care and use of pyrometers; pouring equipment safety; cleaning and finishing castings – gate and riser removal, filing and buffing, commercial cleaning operations, protective finishes;
- b) tumbling, sand blasting, casting inspection;
- c) introduction to alternative casting processes – die casting, permanent mould casting, centrifugal casting, shell moulding, investment casting.

22. Hydraulics

- a) Characteristics and use of hydraulic systems; elementary circuits; function of circuit components; utilization for production and control;
- b) basic principles – Pascal's law, force, pressure, area, fluids as liquids and gases;
- c) graphic symbols.

23. Pneumatics

- a) Characteristics of pneumatic systems; elementary circuits; function of circuits; components; utilization for production and control;
- b) basic principles – Boyle's law, Charles's law; elementary systems; graphic symbols;
- c) characteristics of air.

24. Instrumentation	<ul style="list-style-type: none">a) Types and characteristics; types of movements; function as circuit components; utilization for production and control;b) the computer as a controller; introductory end-to-end control.
25. Ornamental metal work	<ul style="list-style-type: none">a) Types, shapes, and applications; methods of shaping and fastening; metal finishes and coatings;b) design fundamentals – alternative assemblies.
26. Rigging	<ul style="list-style-type: none">a) Types and use of hoisting and lifting equipment, slings, and attachment techniques; levelling and alignment techniques.
27. Plastics	<ul style="list-style-type: none">a) Types and uses; thermosetting and thermoplastic materials; polymerization; use of plasticizers, pigments, solvents, lubricants, fillers, and stabilizers.
28. Moulding, forming, and laminating of plastics	<ul style="list-style-type: none">a) Types of moulding and their application; mouldmaking; forming and bending techniques; extrusion; laminating methods and applications; fabricating techniques.
29. Bonding of plastics	<ul style="list-style-type: none">a) Bonding materials and their uses; cohesive- and adhesive-bonding welding techniques and applications.
30. Quality control methods	<ul style="list-style-type: none">a) Reasons for quality control and inspection;b) effects of temperature variations and applied pressure on measurement of parts; reasons for applying tolerances to production parts; principle of interchangeability using limits and fits; importance of surface finish of parts;c) destructive and non-destructive testing methods; use of dyes, X-rays, comparators.
31. Mechanics	<ul style="list-style-type: none">a) Forces, tension, compressions, shear, action and reaction; energy, work, power; types of friction, factors controlling friction, and lubrication; mechanical advantage of machines, levers, wheel and axle, pulley systems, toothed gear, screw, inclined plane.

32. Perspectives on employment

- a) Nature of work; occupations and related jobs; wages and job requirements; obligations and rights of employer and employees; local firms and organizations; union affiliations; further education and training – apprenticeship;
- b) postsecondary education;
- c) professional organizations.

33. Computers and interfacing principles

- a) Three-buss system in a basic computer system, purpose of each section; purpose of RAM and ROM; purposes of interfacing a computer to a fluid power system for robotics and/or other automatic systems.

34. Mechanical power transmission

- a) Gears and gear boxes – principles of gears, purposes and applications, types of gears, speed and torque ratios, input/output, efficiency, shafts; bearings and pillow-boxes; power threads.

35. CNC machines

- a) Basic concepts of CNC machining processes and codes.
-

Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
4. Food Services Grouping	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Machine Shop Practice (Grades 9-12)

Sheet Metal Practice (Grades 9-12)

Welding (Grades 9-12)

Foundry Practice (Grades 9-12)

Power Transmission and Control (Grades 9-10)

Industrial Control – Power and Processes (Grades 11-12)



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Technological Studies

*Intermediate and
Senior Divisions*

Part B

*9. Personal
Services Grouping*

Module 1, 1986



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Introduction to the Personal Services Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, *Part B*, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. *Part A* provides essential background for the planning of all courses in technological studies. The following three sections in *Part A* are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of *Part B* are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in *Part B* is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the personal services grouping. The grouping includes three subjects: cosmetology; guiding and tourist services; and home nursing, child care, and health care services. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, the courses will be their initial introduction to the occupational areas within the personal services grouping. For some, enrolment will be the first step towards an apprenticeship as a hairstylist. For others, it could be an introduction to other occupations related to the industry, such as hunting guide or child care worker. While each of the three subjects outlined in this document deals with unique content, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses in any of these three subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject of this module for planning basic and general level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills

and knowledge outlined as core content for each section. This core content is identified in chart form. All of the core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific learning objectives, which shall be based on the aims for courses at the basic and general levels. The nature of the core aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Personal Services Grouping", at the end of this module, or from the course content listed at the end of any other module in *Part B*.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the personal services grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Personal Services Grouping". The letters *a*, *b*, *c*, and so on represent sub-units of the content units.

Chart 9.1.7 provides a summary of the core content for all courses in the personal services grouping. This summary chart serves as a convenient means of identifying what should be taught, comparing core content requirements for the two levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Personal Services Grouping". Topics from units appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the domestic food preparation section in the food services component may be incorporated into the home nursing, child care, and health care services program if appropriate to a particular theme or project.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in personal services, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 cosmetology, basic and general levels) or at different grade levels (e.g., guiding and tourist services, Grades 11 and 12) are likely to become more common. Although the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Personal services courses based on this module are to a large extent skills oriented. As students acquire skills, they are motivated to acquire related knowledge and to develop desirable attitudes and understanding. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational

steps of the process, whether it is arranging a tour or washing someone's hair. Significant aspects of the completed operation are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in personal services courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's achievement on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained from these experiences is particularly important to today's young people, who face a working life characterized by changing technology and the need to continually update their skills and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should also have opportunities to become aware of the various tasks that computer technology performs in the personal services field. Insights into the use of computer technology to access, record, and process information such as customer records, inventory, and accounts can be acquired through visits to a variety of service establishments.

Cosmetology

Intermediate Division

(Grades 9 and 10)

Courses in cosmetology are intended to assist students in improving their own appearance and to introduce them to the skills and knowledge associated with the hairdressing and barbering trades.

Students who plan to enter an apprenticeship as a hairstylist can benefit from participation in the provincial Linkage program. Information on this program is available from the directors of the regional offices of the Ministry of Education. Students who participate in the program have the opportunity to earn training credits that may excuse them from a portion of the in-school course work that is normally part of the hairstylist apprenticeship.

Courses in cosmetology are authorized for Grades 9 and 10 at basic and general levels of

difficulty. Chart 9.1.1 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division cosmetology courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given only an introductory treatment. It is suggested that fuller treatment be given to those core items related to safety, chemistry and bacteriology basics for hairstylists, shampoo and rinses, and hairstyling.

Chart 9.1.1
Core Content for
Cosmetology
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety, health, and sanitation	a	ab
2. Professional development and human relations	a	ab
3. Chemistry and bacteriology basics for hairstylists	a	a
4. Hair and related chemistry	a	abc
5. Skin and related chemistry	a	ab
6. Physiology of the hair and skin	a	ab
7. Shampoo and rinses	ab	ab
8. Scalp and hair disorders and treatment	a	a
13. Hair colouring		a
15. Hairstyling	a	ab
17. Facial make-up and manicures	a	a
19. Business management, facilities, and equipment	a	ab

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPC1B for Grade 9 and TPC2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- learn to use safely and effectively the implements, equipment, materials, and regulated toxic products of the hairstylist trade;
- develop good work habits and the responsible, co-operative attitude necessary for good working relations with customers, co-workers, and employers;
- acquire the self-confidence needed to complete hairstyling tasks independently;
- master and apply safe work methods and procedures;
- enhance their own appearance or the appearance of others on a non-professional basis;
- improve their ability to comprehend and use both oral and written technical language related to the hairstylist trade;
- acquire knowledge of the employment opportunities in and training requirements for the hairstylist trade and other specialized occupations in the personal services industry.

Suggestions for Teachers

In Grade 9 courses, the core content and aims should be introduced through practical activities that all students can successfully complete. It is particularly important at the basic level of difficulty that students gain confidence in their ability to master the learning.

Grade 9 courses should be exploratory in nature, providing an overview of the personal services industry and relating to this overview as wide a range of core learning experiences in cosmetology as is possible in the allotted course time. Grade 10 courses in cosmetology may begin to develop major themes that can become specialties in Senior Division courses. Activities in Grade 10 courses may focus on one or more of the following major themes: personal grooming, hairstyling, hairdressing, and barbering.

The choice of optional topics should relate closely to the objectives that have been set for the course. Facials and make-up are possible optional topics. The depth of treatment of both the core and the optional content should reflect the ability of the students, the type of course that is being offered, and the facilities that are available for the program.

These courses should emphasize the self-presentation of the cosmetologist, stressing personal hygiene, good appearance, and an attitude of professionalism towards customers, colleagues, and employers.

The three themes of hairdressing, barbering, and hairstyling are dealt with in the apprenticeship training profile for the hairstylist trade. This profile provides clear objectives and criteria for skill development and can be a useful resource for teachers who are planning these courses. The training profile is a component of the Linkage program and is available to secondary school teachers through the directors of the regional offices of the Ministry of Education.

Courses planned around the hairstylist theme can serve the goals of students who plan to enter apprenticeships either as hairdressers or as barbers. Such students need practical hairstyling skills. The courses should therefore include as many topics as possible from the optional content of units 1 to 19, listed at the end of this subject grouping, in addition to the core learning specified in chart 9.1.1.

Courses with a special emphasis on the hair-dressing theme may also be planned for students who wish to acquire some specialized skills and experience in this area for personal use. At this time in their lives, career goals may be of lower priority than personal goals to students interested in this theme. Courses for such students should include topics from units 9 and 15 on cutting, shaping, and designing hair, as well as topics on make-up from unit 17.

Courses that include a barber theme may be developed from this section if there are sufficient students who wish to acquire specialized barbering skills and experience for personal use. Courses based on this theme may include optional topics from units 9 and 16 (listed at the end of this module) in addition to the core content specified for this section. Although courses with a barbering theme can provide useful career exploration for students, those who wish to pursue barbering through apprenticeship would benefit from a course with a

hairstylist theme – a course that emphasizes the core topics that hairstyling and barbering have in common.

In the various learning activities related to cosmetology, efforts should be made to reinforce the basic language and computational skills required in the trade. Such skills form a base from which students can extend their learning in this career field.

In cosmetology, as in other personal services fields, the personal relationship between the customer and the service provider is important. Thus, teachers should regularly demonstrate and reinforce friendly, courteous techniques. A helpful attitude is an important asset to any student who hopes to work successfully in a personal services trade.

Grade 9 and 10 students investigating various occupations as career options should be made aware that both men and women work in all areas of cosmetology.

General Level

Course codes assigned to general level courses planned under this section will be TPC1G for Grade 9 and TPC2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards safety, cleanliness, and efficiency in tasks of the cosmetology trade;
- set high standards for their work and take pride in meeting those standards;
- acquire general knowledge of current hair-styles and make-up;
- develop the ability to work co-operatively with customers, peers, and supervisors;
- develop skills in styling hair and applying cosmetics that can be put to personal use;
- acquire the knowledge, understanding, and skill necessary to comply with the requirements of the Food and Drug Act, local by-laws, and other legislation concerning personal cleanliness and the sanitary condition of equipment and working areas in the beauty salon;
- acquire knowledge of careers and further training opportunities related to cosmetology and a perspective on the place of this industry within the broader personal services field.

Suggestions for Teachers

Teachers planning courses in cosmetology for students studying at the general level of difficulty may use some of the suggestions outlined for basic level courses. Creative projects involving an independent literature search that goes beyond the minimum achievement specified in the hairstylist training profile may also be included in these courses.

Grade 9 and 10 courses in cosmetology at the general level are exploratory in nature. Students participating in these courses should be able to test their aptitude for and interest in the hairstylist trade and gain insights into a variety of related occupations.

In Grade 10 cosmetology courses at the general level, the classroom can be operated as a hairstyling shop, with students working as receptionists, making appointments, keeping accounts, stock keeping, and working on live

models. In addition to the core learning identified in this section, optional subunits from unit 19 can be selected to support this business theme.

The apprenticeship training profile for the hairstylist trade reflects the core aims and content specified earlier in this section. It is a comprehensive document, specifying the performance objectives and criteria required for the trade, and can be a useful resource for teachers planning cosmetology courses. Learning experiences that give students practical skills can be readily developed from the profile. It is a component of the Linkage program and is available to secondary school teachers through the directors of the regional offices of the Ministry of Education.

Cosmetology

Senior Division

(Grades 11 and 12)

Senior Division courses in cosmetology are intended to provide students with skill and knowledge related to the hairstylist trade and other specialized occupations associated with the personal services industry, as a basis for employment, further learning, and/or personal use. In addition to developing confidence in their ability to style hair, students taking these courses should acquire efficient work habits and develop positive attitudes that will foster good working relationships with customers, colleagues, and supervisors.

The Linkage program for hairstylists may be incorporated into Senior Division cosmetology courses. Information on this program is available from the directors of the regional offices of the Ministry of Education. Students who participate in the program have the opportunity to earn training credits that may excuse them from a portion of the in-school course work that is normally part of the hairstylist apprenticeship.

Courses in cosmetology are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 9.1.2 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division cosmetology courses may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, chemistry and bacteriology basics for hairstylists, shampoo and rinses, haircutting, permanent waving, and hairstyling.

Chart 9.1.2
Core Content for
Cosmetology
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Safety, health, and sanitation	abc	abcd
2. Professional development and human relations	abc	abc
3. Chemistry and bacteriology basics for hairstylists	a	ab
4. Hair and related chemistry	ab	abcd
5. Skin and related chemistry	ab	abc
6. Physiology of the hair and skin	a	ac
7. Shampoo and rinses	bc	bc
8. Scalp and hair disorders and treatment	a	a
9. Haircutting	a	ab
10. Permanent waving	a	a
11. Thermal pressing and waving	a	abc
13. Hair colouring	ab	ab
14. Bleaching and toning	a	ab
15. Hairstyling	abc	abc

Content Units	Core Content for Courses	
	Basic	General
17. Facial make-up and manicures	a	a
19. Business management, facilities, and equipment	abc	abcd

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPC3B for Grade 11 and TPC4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire competence in the use of implements, equipment, materials, and toxic products associated with the hairstylist trade;
- develop good work habits and the co-operative and responsible attitudes necessary for good working relationships with customers, colleagues, and employers;
- set high standards for their work and take pride in meeting those standards;
- master and apply safe work methods and procedures in the performance of tasks associated with the trade;
- acquire the knowledge and understanding necessary for compliance with the requirements of the Food and Drug Act, local by-laws, and other legislation concerning personal cleanliness and public sanitation in the beauty shop;
- enhance their own appearance and the appearance of others on a non-professional basis;
- learn about employment opportunities and training requirements in the hairstylist trade and about other specialized occupations in the personal services industry.

Suggestions for Teachers

In Grades 11 and 12, the knowledge and skills identified under core content and aims should be introduced through practical activities that all students can successfully complete. In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to master the learning. Activity-centred learning should make up approximately 60 per cent of the course time, so that students can perfect practical skills associated with the trade and develop the attitudes necessary for successful working relationships.

In Senior Division courses in cosmetology, it is recommended that students participate in such out-of-school learning experiences as:

- provision of volunteer beauty services for senior citizens and the disabled in institutions;
- visits to local beauty suppliers;
- attendance at hair fashion shows run by local beauty suppliers;
- visits to private schools that specialize in modelling, make-up, and skin care;
- participation in hairstyling competitions between local schools;
- participation in co-operative education.

Courses based on this section follow a spiraling pattern. Core and optional topics should be studied at greater depth and breadth each time they are structured into a course. This approach continues into college training programs, which extend what students have already learned, stressing practical details and the requirements for working in the trades.

The performance objectives outlined in the training profile for the hairstylist apprenticeship program are recommended as curriculum content for Senior Division courses in cosmetology. This content corresponds to the content outlined in units 1 to 19, listed at the end of this subject grouping. When such courses are registered in the provincial Linkage program, students may earn training credits that will excuse them from part of the in-school course work required of hairstylist apprentices. Where it is not feasible for students to cover requirements outlined in the training profile, more limited themes, such as manicuring, shampooing, corrective hair treatment and styling, and thermal waving, may be developed.

In a secondary school program in cosmetology, a series of courses may be planned to cover the complete training profile for hairdressers. By starting in Grade 9 or 10, students

taking such courses can meet the terminal performance criteria for the in-school learning normally attained by apprentices. Ideally, this sequence of courses can be combined with work experience that will reinforce the required skills and knowledge. In approved programs in which combined course work and work experience total 1500 hours or more, successful graduates are eligible to write the provincial examination for the Certificate of Qualification, Hairstylist, Branch 2 – Hairdresser. This route is an alternative to regular apprenticeship. The policy and requirements for the 1500-hour hairdresser program are outlined in Ministry of Education Memorandum 1981–82: 2. Further information on the program is available through the regional offices of the Ministry of Education.

Work experience can benefit students at any stage of their Senior Division course work. Early experiences may be an effective means of exploring careers; later experiences can reinforce and further develop course objectives. Co-operative work experience or part-time work in the cosmetology field can improve students' chances for employment and career success in this field after graduation. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

General Level

Course codes assigned to general level courses planned under this section will be TPC3G for Grade 11 and TPC4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop a positive attitude towards safety in hairstyling;
- master efficient hairstyling methods and procedures;
- acquire some understanding of the structure and composition of skin, scalp, and hair and the effects on them of various hairstyling products and processes;
- develop technical literacy relative to the hairstylist trade, so that they can complete

- patrons' records, follow manufacturers' instructions, report on applications of new products and procedures, and do independent study of topics related to the trade;
- study the legal aspects of operating a beauty shop;
- be a member of a group and develop the interpersonal skills necessary for both leadership and co-operation;
- acquire an understanding of the advantages and disadvantages of self-employment;

- develop the basic skills necessary to perform cosmetology tasks efficiently;
- acquire the skills and ability necessary to maintain and improve personal grooming;
- acquire a general overview of the additional training and employment opportunities available to graduates of a cosmetology program.

Suggestions for Teachers

Suggestions outlined in the basic level section (Senior Division) and in both of the Intermediate Division cosmetology sections may be adapted to courses planned for the general level. Content can be treated at greater depth in general level courses than in basic level courses. In many cases, this greater depth may be reached through independent study of enrichment topics.

Courses offered at the general level to students who are considering hairstylist apprenticeships or other jobs in the personal services field should provide them with opportunities to acquire skills and experiences that are fundamental to the trade. At the same time, students should acquire basic knowledge of the subject and should thoroughly master the basic skills that they will require to extend their learning in the subject field. Exploratory study of the chemical, anatomical, and physical properties of hair, skin, and scalp relative to the structure, functions, and effects of hairstyling products and processes is an important theoretical component of these courses.

Special safety rules related to specific materials, equipment, procedures, and environmental conditions should be introduced as the appropriate situations arise. General safety procedures and the responsibility of every student to follow them should be discussed at the beginning of the course and closely adhered to. Although bacteria will be discussed when the class is dealing with unit 3, culturing of such organisms is unsafe and therefore not recommended.

Projects at the general level should incorporate the practical activities, operations, and concepts included in the core learning and reflect the specific objectives set by the teacher for the course. A wide range of appropriate projects is available, any of which may be used as a practical test of student achievement.

Major assignments that involve literature search or the development of resources and structure for a seminar may be undertaken by individuals or groups of students. The strategy of involving groups of students in projects of their own choice is an effective way of approaching some of the attitudinal aims of the course. Suggestions outlined in design studies (materials, processes, and design grouping) for groups involved in project technology can be of assistance to teachers who wish to apply this strategy. Examples of student projects of a research or creative nature include:

- planning and designing the layout for a model salon;
- writing a paper and/or making a presentation on the history of make-up;
- styling hair and applying make-up for a fashion show;
- preparing a style book using pictures of hairstyles gathered from trade journals and magazines.

Guiding and Tourist Services

Intermediate Division (Grades 9 and 10)

Intermediate Division courses in guiding and tourist services are intended to assist students in developing skills and knowledge that can be applied to a variety of tourist service occupations. These courses explore the role of the guide in hunting, fishing, and conducting local tours. The activities of travel agencies and tourist information centres are also explored.

Courses in guiding and tourist services are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 9.1.3 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety in guiding and tourist services, wilderness travel, and hunting and fishing.

Chart 9.1.3
Core Content for
Guiding and
Tourist Services
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
49. Wilderness travel	ad	abd
50. Hunting and fishing guide	a	a
51. Safety in guiding and tourist services	ab	a
52. Tourism – local information	ab	acf
53. Tourist services	a	abe
54. Tourist industry – public relations and communications	ab	ace

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPG1B for Grade 9 and TPG2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- begin to develop the skills essential for planning and undertaking land and water travel in the wilderness;

- acquire knowledge of local hunting and fishing regulations and some basic skills in guiding tourists who are interested in these activities;
- understand the need to practise and promote safety in travel, guiding, and other activities related to tourism;

- acquire knowledge of local and regional tourist attractions, natural resources, and transportation alternatives;
- improve their ability to communicate requested information and foster the good will of tourists;
- acquire knowledge of careers and further training opportunities in guiding and tourism and a perspective on the infrastructure and economic importance of this industry.

Suggestions for Teachers

In Grade 9 and 10 courses based on this section, the knowledge and skills identified under core content and aims should be introduced through practical activities that all students can successfully complete. In courses at the basic level of difficulty, it is particularly important that students gain confidence in their ability to master the learning.

Exploratory activities related to the theme of guiding can be structured to provide insights into other aspects of the tourist industry included in the core learning for this section. Students should be made aware, as they undertake each learning experience, of the objectives it is designed to meet.

The theme of guide for hunting and fishing may be further developed around optional topics listed in units 49 and 50. The learning activities under this theme should include field work. These studies may be augmented as well by selected topics from the small engines section of the transportation component and by the domestic food preparation section of the food services component. Presentations by local residents who are knowledgeable about various aspects of this theme can be useful and stimulating, particularly when ample time is allowed for student discussion.

Safety awareness and the development of work habits and operational practices that reflect safety considerations need to be stressed in every learning experience involving physical activity. This emphasis on safety is particularly important in training for guiding activities that could eventually take place in remote areas with inexperienced clients. A knowledge of first aid is also useful for the future guide. Students who are intending to pursue a career

in guiding should take first aid courses from a recognized organization such as St. John Ambulance.

The development of effective interpersonal skills is an important aspect of training as a guide. Guiding involves a wide range of communication activities. The successful guide is a congenial host, is polite, and is equally attentive to all clients. Guides should be able to project confidence when under stress or handling emergencies. They should be able to listen to complaints calmly and handle them fairly. An effective guide adheres to a schedule and appears organized at all times.

Most students studying at the basic level have limited scholastic abilities. Courses in guiding and tourist services can offer many opportunities for building and reinforcing students' linguistic and computational skills. For example, the assignment of describing a particular local attraction to a visitor can help students to develop vocabulary and sharpen writing and speaking skills. Similarly, assignments that require the use of travel schedules and hotel brochures can reinforce numerical skills: students can calculate trip times, travel costs, and other tour costs that clients might request.

Courses at the basic level should be vocational in nature. Exploratory visits to agencies, and discussions with individuals who offer tourist services, should be provided if possible. Such activities can afford information about various occupations associated with the industry and can clarify vocational aspects of students' studies.

General Level

Course codes assigned to general level courses planned under this section will be TPG1G for Grade 9 and TPG2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop and promote positive attitudes towards safety in travel, guiding, and other activities related to tourism;
- develop the skills necessary to collect information about tourist attractions, accommodations, travel routes, guiding services, and anything else that might be of interest to tourists;
- improve their skills in reading, writing, and discussing information about travel;
- develop the ability to read and understand the laws and regulations governing fishing, hunting, and travelling in the wilderness;
- develop the skills involved in fishing and hunting and the ability to guide others in these activities;
- acquire some understanding of the importance of tourism to the economy and ways in which it can be promoted;
- acquire knowledge about the additional training and occupational opportunities available to graduates from a program in guiding and tourist services.

Suggestions for Teachers

Grade 9 and 10 courses designed for the general level should provide an overview of the tourist service industry; exploratory activities should focus on the theme of guiding.

Suggestions for learning activities related to the theme of guiding, outlined in the section for basic level courses, can be readily adapted to general level courses. In addition, students should investigate more thoroughly the local tourist services and related occupational opportunities.

An inventory of local tourist services and attractions is a desirable class resource. The development of this inventory should be an ongoing activity for the class. The topics identified in unit 52, including the optional topics, indicate the range of information that is of interest to tourists. Either individually or in groups, students can take on the project of assembling the data associated with the various topics. The resulting inventory of information can then be maintained as a class resource. The effective use of this information is achieved when students have the opportunity to dispense it as a service. To facilitate this outcome, teachers can arrange simulations in which students practise making courteous and friendly responses to queries. A log of actual queries, identified by students during

work experiences or other activities in the community, may also be maintained by the class as a record of the kinds of information requested by visitors.

Students should be made aware that general knowledge is a valuable asset to the guide. Guides are expected to be knowledgeable about local folklore, culture, economics, and current affairs. They are expected to know local history and geography. In addition, some understanding of other cultures will help them to understand the preferences and behaviour of clients from other countries.

To explore self-employment in a tourist service venture, students at the general level can, as an exercise, identify a potential service (such as guided fishing or a tour of a local tourist attraction) and prepare a piece of promotional material describing it.

Students taking courses at the general level may be exploring the subject for vocational purposes or seeking general information about the industry. Assignments should require independent research, including an exploration of job opportunities and of the various training routes to employment in the industry.

Guiding and Tourist Services

Senior Division

(Grades 11 and 12)

Guiding and tourist services courses can provide students with basic knowledge and skills that are applicable to a variety of occupations in the tourist service industry.

Students who proceed through courses in the Senior Division based on either of the following sections should find an increasing emphasis on preparation for employment or further study. The courses should centre around the tourist services theme and probe the various aspects of this career field, with particular emphasis on the occupation of guide for hunting and fishing. Although graduates of these courses will have good basic skills in either guiding or tourist servicing, they will not be fully trained and will require further training, either at a community college or on the job.

Graduates who wish to work as travel counsellors or in travel administration, promotion, or planning may continue their studies at a college of applied arts and technology.

Courses in guiding and tourist services are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 9.1.4 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety in guiding and tourist services, wilderness travel, and hunting and fishing.

Chart 9.1.4
Core Content for
Guiding and
Tourist Services
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
49. Wilderness travel	abc	abce
50. Hunting and fishing guide	abc	abd
51. Safety in guiding and tourist services	ab	a
52. Tourism – local information	acde	acde
53. Tourist services	abc	abcde
54. Tourist industry – public relations and communications	abcd	abcd
55. Major legislation affecting tourism	a	a

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPG3B for Grade 11 and TPG4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire the skills and knowledge necessary to interpret and follow the rules and regulations governing both hunting and fishing;
- develop the skills necessary to arrange and conduct an extended fishing or hunting trip;
- acquire general knowledge of the first aid procedures that may be necessary in the wilderness;
- continue to develop the knowledge and skills necessary for survival in wilderness conditions;
- plan a specific guiding service and set a price based on estimated costs;
- acquire information about local and regional tourist attractions, natural resources, and

transportation alternatives and learn to communicate it to interested individuals;

- acquire skill in locating additional information about local accommodations, food, transportation, entertainment, health, and other services;

- acquire knowledge of employment opportunities in and training requirements for the guiding and tourist services and specialized occupations in the personal services industry;
- develop an appreciation for the importance of conservation, the significance of pollution, and the ethics involved in both fishing and hunting.

Suggestions for Teachers

Either guiding or tourist services may be a main theme, with the other as a subtheme. The suggestions for a guiding service theme outlined in the Intermediate Division sections can be further developed in Senior Division courses. The activities may be broadened to include the development of various promotional materials and a study of the licensing, contractual, and budgetary needs of an independent guide service. The business aspects, including provisioning, fee structuring, customer accounts, and other small-business-management concerns, may also be included. Topics selected from units 53, 54, and 55 are appropriate to objectives of this nature.

Students should have the opportunity to practise the skills of more than one occupation during the course. Where guiding is the main theme, students should develop some proficiency in guiding tours of local attractions as well as hunting and fishing trips.

Topics from units 53, 54, and 55, listed in the core content and/or at the end of this subject grouping, can support a variety of course

objectives for a tourist services theme. As tourist services embrace a wide spectrum of occupations, from travel counselling to managing tourist attractions, courses may be structured to allow groups of students to examine different vocations at the same time. A group may investigate a single type of occupation or a mix of occupations. The activities should clarify the infrastructure of the tourist industry and the interdependence of its component occupations.

The development of an inventory of local tourist services and attractions (suggested for general level courses in the Intermediate Division section for this subject) can be undertaken as a supplementary activity by students when they are examining the various occupations. The inventory can include information and promotional items related to the various services – items that can serve as an additional resource for students involved in problem solving and design activities.

The practical activities involved in learning the basic skills and information required by hunting and fishing guides can be planned to support certain other occupations as well. Significant skill and knowledge components of jobs as varied as line cutter and marina helper can be achieved by students in these courses if particular course objectives are broadened and if the course includes appropriate optional content from other subject fields, such as small engines. The planning of course components of this type should reflect local employment opportunities.

Work experience can benefit students at any stage of their Senior Division course work. Early work experiences may be used effectively to explore careers; later experiences can be used to reinforce and further develop course objectives. Co-operative work experience or part-time work in the tourist services field can improve students' chances for employment and career success within this field after graduation. Some students may also wish to investigate the possibilities and requirements for self-employment in this field.

General Level

Course codes assigned to general level courses planned under this section will be TPG3G for Grade 11 and TPG4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- continue to develop planning, promotional, selling, and other skills necessary for marketing and delivering a tourist service;
- continue to develop skills essential for planning and undertaking land and water travel in the wilderness;
- acquire knowledge of local hunting and fishing regulations and the skills required to lead hunting and fishing expeditions;
- practise and promote safety in travel, guiding, and other activities related to tourism;
- acquire information about local and regional tourist attractions, natural resources, and

travel routes and learn to communicate it to interested individuals;

- acquire skill in locating additional information about local accommodations, food, transportation, entertainment, health, and other services;
- plan a specific tourist service and develop a budget for pricing it appropriately;
- acquire knowledge of career and further training opportunities related to tourism and a perspective on the infrastructure and economic importance of this industry;
- develop an appreciation for the importance of conservation, the significance of pollution, and the ethics involved in both fishing and hunting.

Suggestions for Teachers

In Senior Division courses at the general level, the subject of guiding for hunting and fishing can be a subtheme of tourist services.

Suggestions in the basic level section of this Senior Division guideline, and the suggestions that appear in both sections of the Intermediate Division guideline for this subject, can be adapted to support these courses. Students should be expected to build on the practical guiding experiences they acquire as part of the core learning and to develop an understanding

of the various connections between a successful guiding service and the overall field of tourist services.

Assignments involving investigation of various tourist services and identification of common features of these services should require the student to actively search for and analyse information. An outcome of these activities can be the development of a plan for marketing a tourist service. Discussion with a knowledgeable businessperson or enrolment in a related business course can motivate students

in the preparation of their proposals for a tourist service and encourage them to aspire to self-employment.

Students who enrol in general level courses based on this section should be made aware of the continuing education opportunities available through community colleges and other institutions. An awareness of the entry requirements and content of such programs should influence the students' choice of related courses in Senior Division. Related business courses, for example, can give students the background they need for further study.

Work experience opportunities, even if they are brief, should be a component of all Senior Division courses based on this section. Students who participate in such experiences

should be aware that good interpersonal skills are necessary for success in this service field and should use the work opportunity to improve in this area.

Students should also be aware that safety is an important aspect of the delivery of any personal service. Safety discussions during the practical guiding experiences should develop in students a positive attitude towards safety that transfers effectively to other work situations.

Home Nursing, Child Care, and Health Care Services

Intermediate Division

(Grades 9 and 10)

Courses based on the following sections are intended to assist the student in developing the skills and knowledge necessary for proper care of self and others.

The student will be prepared for homemaking responsibilities and instructed in the art of nurturing others. The knowledge, skills, and experience students gain are applicable to such personal services occupations as institutional housekeeper, provider of home care and support services, day care worker, child care aide, and health care aide, as well as parent and homemaker.

Courses in home nursing, child care, and health care services are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 9.1.5 identifies the core content for these levels. This content provides

a stepping stone towards more in-depth study in the Senior Division. The aims and suggestions for designing Intermediate Division courses are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to homemaking, basic first aid, and personal hygiene.

Chart 9.1.5
Core Content for
Home Nursing,
Child Care, and
Health Care
Services
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
21. Introduction to nursing procedures and home nursing	a	b
27. Homemaking	a	b
36. Disorders and disease prevention and control	a	b
37. Basic first aid	a	b
38. Basic nutrition and diet	a	b
41. Infant and child care	a	b
46. Personal hygiene	a	b

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPH1B for Grade 9 and TPH2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- practise and promote good health and safety habits;
- follow instruction and work with others in a practical classroom setting;
- develop an appreciation of honesty, self-control, fair play, and aesthetic values;

- acquire organized work habits and take pride in accomplishments;
- demonstrate a caring attitude while developing competence in basic skills;
- prepare for activities of daily family living and community life;
- acquire knowledge of the occupations and further training opportunities associated with this personal services field.

Suggestions for Teachers

Intermediate Division courses should be exploratory in nature, providing an overview of home nursing, child care, and health care services. All teaching should be pertinent to the needs of the student in today's world. Male and female students alike should be encouraged to enrol in this course in order to acquire some of the basic life skills. Learning to interact effectively with peers and with children is an important component of these introductory courses.

The choice of optional topics should relate closely to the objectives that have been identified for the particular program. Courses that emphasize an in-school child care program should include the various aspects of child growth and development. Topics selected from unit 42, for example, can prepare students for work with preschool children. Optional topics from unit 25, "Geriatrics", can also be included, to introduce students to an area in which they may wish to specialize in Senior Division. In all cases, dependability, appropriate communication, and good humour should be stressed in the learning activities. Development of these personal characteristics can improve students' ability to work effectively in this field of personal services.

Practical application of the theory should be emphasized in all courses based on this section. Wherever possible, students should practise procedures in pairs, taking turns being care-giver and care-receiver. This role playing

will encourage the development of empathy, patience, and respect for human dignity.

Opportunities may arise for students to work as mothers' helpers, household aides to the elderly, baby-sitters, or hospital volunteers. Expectations and responsibilities on such jobs should be carefully discussed with all parties involved. The limited studies in Intermediate Division courses should not be considered sufficient preparation for employment as a child care aide or health care aide. They serve only as an introduction.

It can be beneficial for students to divide their notebook into sections corresponding to core topics. Making each day of the week correspond with a particular core topic can also help students with their organizational skills. A notebook section on simple medical terminology, entitled "Words to Know", can increase vocabulary during the students' introduction to this particular discipline.

The development of positive attitudes towards safety involves much more than students' following a set of safety rules provided by the teacher. Recognition of the need to follow procedures and routines that are efficient and safe is an important part of the students' learning, and should lead to safety awareness in all activities. With practice, students should acquire the ability to develop their own routines and set appropriate limits in the activities they initiate to ensure a predictable and safe environment for all concerned.

General Level

Course codes assigned to general level courses planned under this section will be TPH1G for Grade 9 and TPH2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe, clean, efficient work habits, both professional and personal;
- develop a positive attitude towards regular attendance and punctuality;
- develop the ability to follow both written and oral instructions;
- acquire a general knowledge of basic medical terms appropriate to personal services activities associated with this course;

- develop the basic skills necessary to perform tasks related to home nursing, child care, and health care;
- expand social and practical skills as necessary for a sense of self-worth and for rewarding companionship, family living, and job placement;
- become aware of subsequent specialty courses available for further personal growth and of job opportunities in the personal services field.

Suggestions for Teachers

General level courses in the Intermediate Division are exploratory in nature. Although the core learning at this level is more challenging than at the basic level, all suggestions made for basic level courses may be adapted to general level courses.

Suitable guest speakers can be invited, to reinforce student motivation. These could include a public health nurse from a well-baby clinic, a St. John Ambulance worker, a fire department officer, and other community workers. Optional unit 45 includes topics that are appropriate for this approach. Field trips to do comparison shopping and visits to a local day care centre can also be beneficial learning activities. As well, work experience in a nearby kindergarten, assisting the teacher with various activities, can provide enrichment for selected students.

Projects related to core content can be structured to help the student research and organize material independently. One topic could be

sources and functions of basic nutrients, selected from unit 38, "Basic nutrition and diet".

Information about various occupations in this personal services field can be acquired gradually by students throughout the course. Students can list occupations that centre on children's services, such as child care worker; occupations that relate to the elderly, such as health care aide; and occupations that require the full range of homemaking services. The activities, knowledge, skills, and further training related to each occupation can be summarized and noted by students as this information is obtained during the various learning activities planned for the course.

Home Nursing, Child Care, and Health Care Services

Senior Division (Grades 11 and 12)

Courses based on the following sections are designed to lead to specialized occupations such as child care worker, provider of home-making services, health care aide, and other health science occupations such as hospital orderly. Students should be made aware that further training and education after graduation from secondary school are necessary for careers in most of these occupations.

The broad base of practical skills and knowledge introduced at the Intermediate level is first reinforced and then further developed in Senior Division courses based on this section. Students then choose a specialty area such as child care, home care, or health care for the elderly and, wherever possible, participate in a related work experience in the community. The student's course work should support his or her choice of occupation as much as possible.

Courses in home nursing, child care, and health care services are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 9.1.6 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 330 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to nursing procedures and home nursing, diets and nutrition, geriatrics, and child care aide skills.

Chart 9.1.6
Core Content for
Home Nursing,
Child Care, and
Health Care
Services
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
2. Professional development and human relations	d	e
21. Introduction to nursing procedures and home nursing	c	d
24. Diets and nutrition for sick and elderly	a	b
25. Geriatrics	a	b
26. Family living	ab	ab
43. Understanding young children	a	b
44. Introductory child care aide skills	a	b
45. Community services	a	b
47. Bacteriology	a	b
48. Human anatomy	a	b

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TPH3B for Grade 11 and TPH4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- continue to practise and promote good health and safety habits and good body mechanics (grace and ease) in performing common tasks;
- develop an attitude of respect and co-operation towards fellow workers and supervisors;
- interact skilfully with care-receivers;
- use and understand, in both speech and writing, some of the terminology related to their chosen specialty;

- develop parenting, homemaking, and health care skills to enable them to become responsible members of the community;
- gain practical experience and reinforcement of their occupational interest by taking part in a co-operative education or work experience program, and be evaluated on the job during their work placement;
- gain employment in their field of occupational interest.

Suggestions for Teachers

Courses should be career oriented. The goal is for the student to become an independent, fulfilled, and contributing person in his or her occupational area of interest.

Visits by guest speakers from nursing homes, homes for the aged, retirement homes, day care centres, and various community agencies to explain their roles are very beneficial. Field trips to these agencies will help in clarifying their functions and goals for the students.

Student involvement in researching background material, extending invitations to speakers, and preparing letters of thanks provides further opportunities for learning. Where facilities permit, in-class programs for preschool children can be arranged to provide teacher-supervised practical work for students.

In planning activities and selecting optional topics for courses based on this section, teachers may wish to select an occupational theme. Such a theme can increase not only students' ability to accomplish the tasks performed in service jobs but also their confidence, their sense of responsibility, and their maturity. Tasks that are common to several service occupations are particularly useful. This theme approach involves the students'

appearing and behaving professionally, dealing with their feelings in response to work situations, seeking direction and assistance, and accepting the personal limitations that characterize them at this stage in their training.

Suggestions outlined in both sections of the Intermediate Division for home nursing, child care, and health care services may be adapted to courses planned under this section.

Students should have opportunities in Senior Division courses for co-operative work experience and career exploration in order to gain first-hand information on employment possibilities and to put into practice the learning acquired in the in-school component. Students may effectively explore potential careers through early work experiences. Later experiences can reinforce and further develop course objectives and can also introduce the student to the real work environment and provide vocational direction. Work experience should always be closely monitored by the teacher and involve ongoing evaluation by teacher, student, and employer.

Prior to their work experience, students should have a medical checkup and a tuberculin test. Attractive uniforms will help them to feel confident about their appearance. A list of acquired skills can be used to communicate a

student's capabilities to the employment supervisor at the outset. Once on the job, students often find it useful to keep a log of the procedures in which they are involved and to share with the class their feelings about the work experience.

General Level

Course codes assigned to general level courses planned under this section will be TPH3G for Grade 11 and TPH4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- continue to acquire the safety habits, attitudes, and skills conducive to employment or acceptance into a community college program;
- continue personal growth, demonstrating the initiative required for employment and the motivation to further their education;
- develop the confidence to assume responsibility and the ability to work both independently and co-operatively;

- develop problem-solving skills through role playing;
- develop routines and set limits to provide and maintain a predictable and safe environment;
- take part in a co-operative education or work experience program;
- acquire introductory skills and knowledge related to the occupation of child care aide (through experience in a day care program) and/or geriatric health care aide (through experience in an institutional or community setting).

Suggestions for Teachers

All suggestions made for the basic level courses (Senior Division) may be applied to the general level courses with minor adaptations. Content can be treated at greater depth in general level courses than in basic level courses. In many cases, particularly where the two levels are offered in the same class, this depth may be achieved through independent study and completion of challenging projects.

Programs that promote interaction between age groups have proven successful. Offering services to the community in the areas of child care, geriatric health care, and home nursing can enhance the quality of life for everyone involved. These student services can be instituted in a number of ways. For example, students can be organized to host children and the elderly in the classroom on an ongoing structured basis. Students may plan entertainment, food, and socialization, according to the age group being hosted.

Agencies such as St. John Ambulance and Red Cross will give first aid courses, and most community agencies will provide demonstrations and information for student projects.

Employers involved in co-operative education and work experience programs should be encouraged to visit the school, observe the working situation in the classroom, provide information, and comment on student employment in the workplace.

By brainstorming with others in the field of child care or geriatrics and with colleagues from other schools, teachers can strengthen the overall program and aid in professional development. Workshops and conferences on aging and child development offer new information and a means of keeping pace with changes in equipment and materials. Membership in such agencies as the Gerontological Nursing Association can also help teachers keep current.

Summary of Core Content for Courses in the Personal Services Grouping

Chart 9.1.7

Content Units	Cosmetology (Grades 9-10)				Guiding and Tourist Services (Grades 9-10) (Grades 11-12)				Home Nursing, Child Care, and Health Care Services (Grades 9-10) (Grades 11-12)			
			(Grades 11-12)									
	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General
1. Safety, health, and sanitation	a	ab	abc	abcd								
2. Professional development and human relations	a	ab	abc	abc							d	e
3. Chemistry and bacteriology basics for hairstylists	a	a	a	ab								
4. Hair and related chemistry	a	abc	ab	abcd								
5. Skin and related chemistry	a	ab	ab	abc								
6. Physiology of the hair and skin	a	ab	a	ac								
7. Shampoo and rinses	ab	ab	bc	bc								
8. Scalp and hair disorders and treatment	a	a	a	a								
9. Haircutting			a	ab								
10. Permanent waving			a	a								
11. Thermal pressing and waving			a	abc								
12. Hair straightening												
13. Hair colouring		a	ab	ab								
14. Bleaching and toning			a	ab								
15. Hairstyling	a	ab	abc	abc								
16. Shaving, moustache and beard trimming												
17. Facial make-up and manicures	a	a	a	a								
18. Facial massage												
19. Business management, facilities, and equipment	a	ab	abc	abcd								
20. Hospital housekeeping												
21. Introduction to nursing procedures and home nursing									a	b	c	d
22. Life expectancy												
23. Prevention of disabilities and diseases in the aged												
24. Diets and nutrition for sick and elderly											a	b
25. Geriatrics											a	b
26. Family living											ab	ab
27. Homemaking									a	b		
28. Money management												
29. Housing, furnishings, and home maintenance												
30. Reproduction												

Content Units	Cosmetology (Grades 9-10)				Guiding and Tourist Services (Grades 9-10)				Home Nursing, Child Care, and Health Care Services (Grades 9-10)			
	(Grades 11-12)		(Grades 11-12)		(Grades 11-12)		(Grades 11-12)		(Grades 11-12)		(Grades 11-12)	
	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General
31. Roles of expectant mother and father												
32. Prenatal and postnatal care												
33. Baby's bath layette and sleeping accommodation												
34. Appearance, growth, and development of infants												
35. Routines for children												
36. Disorders and disease prevention and control									a	b		
37. Basic first aid									a	b		
38. Basic nutrition and diet									a	b		
39. Food purchasing and storage												
40. Preschool care												
41. Infant and child care									a	b		
42. Growth and development of preschool children												
43. Understanding young children											a	b
44. Introductory child care aide skills											a	b
45. Community services											a	b
46. Personal hygiene									a	b		
47. Bacteriology											a	b
48. Human anatomy											a	b
49. Wilderness travel					ad	abd	abc	abce				
50. Hunting and fishing guide					a	a	abc	abd				
51. Safety in guiding and tourist services					ab	a	ab	a				
52. Tourism – local information					ab	acf	acde	acde				
53. Tourist services					a	abe	abc	abcde				
54. Tourist industry – public relations and communications					ab	ace	abcd	abcd				
55. Major legislation affecting tourism							a	a				

See "Course Content for the Personal Services Grouping", beginning on page 27, for description of the subunits a, b, c, etc.

Course Content for the Personal Services Grouping

1. Safety, health, and sanitation

- a) Personal and public hygiene; safe shop practice; sanitation of shop, equipment, and implements; safe handling and storage of tools, equipment, and toxic materials; fire hazards, fire drill;
- b) federal, provincial, and municipal legislation pertaining to hairstylist trade and salons;
- c) patron illness (calling physician if necessary); first aid and first aid equipment; firefighting; correct posture for standing, sitting, stooping, and lifting;
- d) Food and Drug Act, Public Health Act;
- e) regulations under the Apprenticeship Act, municipal by-laws re building, health, and fire codes; introduction to basic bacteriology; emergency first aid in the home; swallowed objects and poisons, cuts and injuries, burns and scalds, injury by home appliances; safety of children in play areas, gardens, streets, cars, with animals; handling children so as to prevent dangerous falls; safety in the home.

2. Professional development and human relations

- a) Good personal grooming habits; good posture – standing, sitting; expressing oneself in an acceptable manner;
- b) professional conduct;
- c) ethical conduct; using and interpreting trade terminology;
- d) desirable physical and personality characteristics; communication skills; dress code;
- e) importance of self-evaluation and self-image; hobbies and recreational interests; positive group interaction; professional ethics.

3. Chemistry and bacteriology basics for hairstylists

- a) pH; bacteria – types, growth and reproduction, methods for preventing entry into human body, infections; common contagious/communicable diseases (tinea, scabies, pediculosis, capitis, viral infections);
- b) physical forms of matter; mixtures; changes in matter; chemical compounds – oxides, salts, acids, bases.

4. Hair and related chemistry

- a) Composition of hair; structures associated with the hair; hair growth;
- b) colour and greying of hair;
- c) effect of artificial heat on hair;
- d) effects of hairstyling chemicals on hair.

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| 5. Skin and related chemistry | <ul style="list-style-type: none">a) Composition of the skin; functions of the skin;b) disorders of the skin;c) protective mechanisms of the skin – mechanical, bacterial, chemical;d) histology and technical terms associated with the skin. |
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| 6. Physiology of the hair and skin | <ul style="list-style-type: none">a) Basic functions of the body systems as they relate to hair and skin;b) effects of physical disorders on hair;c) effects of physical disorders on scalp, skin, and hair;d) effects of various chemicals/drugs on hair and skin. |
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| 7. Shampoo and rinses | <ul style="list-style-type: none">a) Reasons for giving a shampoo; types of shampoos and their effects; selection and correct use of materials and implements; hygienic procedures (washing hands); draping and preparing patron (removal of jewellery, spectacles, etc., by patron); adjusting the seat; brushing/combing hair in preparation for shampooing;b) shampoo methodology; rinse methodology;c) scalp manipulations; rinses – types, correct use, components, pH, and chemical changes caused by each. |
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| 8. Scalp and hair disorders and treatment | <ul style="list-style-type: none">a) Hair and scalp problems – types, causes, conditions that require physician's care, conditions that the hairstylist may treat, accepted treatment practices; scalp massage methodology; electrical equipment used in scalp treatments. |
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| 9. Haircutting | <ul style="list-style-type: none">a) Types, variations in length; implements; cutting techniques and service methodology;b) haircuts – types (blunted, graduated, layered, tapered, shingled, etc.), dry and wet cutting characteristics;c) selecting hairstyle – facial features, head shape, natural parting, texture and growth patterns of hair, patron's wishes; thinning and slithering hair. |
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10. Permanent waving

- a) Types of permanent wave; physical and chemical action of waving and neutralizing solutions; methodology of permanent waving service – checking for possible disorders and allergies, preparing patron, determining type of rod and solution strength, selecting required materials, shampooing, combing for sectioning, wrapping hair, applying waving solution, processing and testing curls, neutralizing, rinsing, cleaning up, and sanitizing equipment;
- b) history of permanent waving; types of permanent waves – spiral, croquignole, combination of spiral and croquignole, preheat, machineless, cold wave, acid wave; effects of waving and neutralizing solutions on structure and composition of hair, scalp, and skin; permanent curly look – processing solution, “s” pattern, methodology.

11. Thermal pressing and waving

- a) Types – marcel, press and curl, defrizzing (blow drying), croquignoling;
- b) techniques – roller set, thermal curling iron, blow dry styling; methodology of service;
- c) techniques – heat according to type of comb; physical and chemical effects when thermal implements are used on various hair textures;
- d) methods of pressing hair – hard press, medium press, soft press.

12. Hair straightening

- a) Principles of hair straightening and necessary precautions; selecting product and strength on the basis of hair condition; chemical effects on hair of products used in hair straightening; selecting correct implements and materials; techniques – applying protective base, applying relaxer cream, combing or hand smoothing hair; methodology of service.

13. Hair colouring

- a) Natural colour, complexion and use of colour key (chart); types of hair colouring – temporary, semipermanent, permanent; tests – allergy, strand colour, methodology of tinting service; colour spectrum applied to hair colouring;
- b) chemical and physical effects of colour application on hair; metallic dyes; history of hair colouring service; virgin hair and retouch application; release statement.

14. Bleaching and toning	<ul style="list-style-type: none">a) Techniques – selecting and using lighteners, applying bleach to virgin hair, re-touching, applying temporary colour rinse to lightened hair, applying correct toner; methodology of bleaching and toning service;b) chemical and physical effects of bleaching and toning on hair;c) methodology for frosting, tipping, streaking, and hair painting.
15. Hairstyling	<ul style="list-style-type: none">a) Selecting hairstyle and technique(s) – facial features, head shape and profile, natural parting, texture and growth patterns of hair, patron's wishes; hairstyling techniques; methodology for a full hairstyling service; roller setting;b) using pin curls for various effects; back combing and back brushing;c) styling wigs and hairpieces; fingerwaving, braiding.
16. Shaving, moustache and beard trimming	<ul style="list-style-type: none">a) Purpose of lather and steam towels; safety precautions; techniques – shaving a patron's face, trimming a beard and moustache; complete methodology for providing the shaving service.
17. Facial make-up and manicures	<ul style="list-style-type: none">a) Fingernails – composition, growth, shapes; giving a manicure;b) techniques – eyebrow arching, selecting and applying make-up, selecting and applying false eyelashes, removing superfluous hair, repairing nails, applying artificial nails; complete methodology for providing one or more of preceding services.
18. Facial massage	<ul style="list-style-type: none">a) Composition, chemistry, and function of skin; benefits of a facial massage; techniques – facial massage, facial treatment with mask; complete methodology for providing above services.
19. Business management, facilities, and equipment	<ul style="list-style-type: none">a) Physical layout of salon; lighting; ventilation; equipment and tool maintenance; telephone use in the salon; booking appointments and receiving patrons;b) CSA-approved equipment; controlling and ordering stock; keeping patrons' records;c) types of ownership;

- d) accounting records required by law; purchasing, leasing, and renting equipment; physical layout of salon; lighting; ventilation; business laws and insurance for the salon; sales psychology and techniques; interpreting and using manufacturers' specifications.

20. Hospital housekeeping

- a) Hospital history, classifications, functions, organization; hospital housekeeping departments; etiquette; safeguarding the patient's environment; controlling the spread of communicable diseases; classification of bacteria; modes of transmitting communicable diseases; portals of entry of disease into the body; immunity; methods of destroying or inhibiting pathogenic organisms; techniques to prevent the spread of disease (in the hospital and in the community); plan of ward and ward unit; various cleaning methods; routines in cleaning a patient's room; cleaning equipment; cleaning a utility room; care of sinks; care of linen room; an anaesthetic bed; cleaning a washroom; cleaning windows; food trays; care of water jugs and glasses; care of flowers; isolation techniques; aseptic disposal of discharges; disposal of soiled linen from an isolated room.

21. Introduction to nursing procedures and home nursing

- a) Art of communication with ill patients; bed making (open, closed, occupied); personal care, including oral hygiene, washing of face, neck, ears, arms, and back; back rub; oral temperature; how bedpans and urinals are used; lifting and moving patients; feeding a person; hot and cold applications; administering medications in the home; providing physical and emotional comfort;
- b) basic human needs; ways of communicating effectively; hair care; shampooing in bed; simple manicure; foot soak; assisting another in dressing and undressing; chair transfer; partial bed bath; pulse and respiration; recognizing signs and symptoms and reporting them;

	<ul style="list-style-type: none"> c) medical terms; special mouth care; special skin care; bathing – bed, tub, shower; care of dentures; measuring temperature, pulse, and respiration; how a urine specimen is obtained; suppositories; toileting; use of hoist lift and safety devices; early A.M., morning, afternoon, and evening care; accident reporting; ongoing observation and reporting; simple charting; twenty-four-hour clock; d) measuring vital signs; collecting specimens; testing urine – sugar and acetone; use of commode; sitz bath; enemas; diabetic foot care; patient admission, transfer, and discharge; transporting a patient; body positioning and alignment; use of alternating pressure mattress; care of dying patient; post-mortem care.
22. Life expectancy	<ul style="list-style-type: none"> a) Lengthening the life span; characteristics (physical, mental, emotional) of the aging process; attitudes towards the aged (sympathy, understanding).
23. Prevention of disabilities and diseases in the aged	<ul style="list-style-type: none"> a) Common diseases; proper nutrition; skin care; prevention of bedsores; mouth care; elimination; ventilation; ambulation; occupational therapy; community recreation; special safety precautions for the elderly (bed rails, call bells).
24. Diets and nutrition for sick and elderly	<ul style="list-style-type: none"> a) Nutritional needs of the sick; feeding the helpless person; preparing person for mealtime; passing nourishments and drinking water; b) preparing special diets; nutritional needs of the geriatric patient; feeding a geriatric patient with special needs; observing and reporting information concerning meals; fluid balance (measuring intake and output).
25. Geriatrics	<ul style="list-style-type: none"> a) Definition of geriatrics; aging process; physical and emotional needs of the elderly; communicating with the elderly; leisure activities; assistance with activities of daily living; nutritional needs of the elderly; common chronic conditions; medication for the elderly;

	<ul style="list-style-type: none">b) myths and realities of aging; retirement; support networks; change in lifestyle (institutionalization and other alternatives); sex and the elderly; active and passive exercise; specific conditions – CVA, diabetes, Alzheimer's disease, incontinence, depression, cataracts, hearing loss; memory loss.
26. Family living	<ul style="list-style-type: none">a) Reproductive system (male and female); pregnancy, childbirth, and breast-feeding; layette; role of parents; taking orders from professionals by phone; administering medications in the home; planning and preparing nutritious meals and snacks; making special-occasion foods;b) functions and types of families; life passages; launching independent lifestyle; courtship and marriage; parenting.
27. Homemaking	<ul style="list-style-type: none">a) Home environment; housekeeping routines; operating and maintaining appliances; managing money; planning and preparing meals; setting the table; shopping; doing laundry; folding linen;b) home maintenance; purchasing and storing food wisely; ethnic foods; caring for clothing; removing stains.
28. Money management	<ul style="list-style-type: none">a) Income sources – personal, family; expenses – personal, family; income tax; banking; budgeting; credit buying; problems caused by poor money management.
29. Housing, furnishings, and home maintenance	<ul style="list-style-type: none">a) Selecting a home – what, why, where, when; types of housing; financing a home; selecting household furnishings and equipment; using and caring for household equipment; housekeeping duties and routines; home maintenance – washing dishes, floors, walls, windows, etc.; garbage and disposal of waste.
30. Reproduction	<ul style="list-style-type: none">a) Signs and symptoms of pregnancy – presumptive signs, probable signs, positive signs; the reproductive system; role of the family doctor – premarital examinations, prenatal care, physical examinations.
31. Roles of expectant mother and father	<ul style="list-style-type: none">a) Personal care; emotional and psychological changes; responsibilities.
32. Prenatal and postnatal care	<ul style="list-style-type: none">a) Signs and symptoms of pregnancy; care of expectant parents; care of mother before and after delivery; home preparations.

33. Baby's bath layette and sleeping accommodation	a) Preparing a room; equipment required; types and methods of bathing; methods of dressing and undressing a baby; layette – type and amount of clothing, proper laundering of clothing, types of diapers; sleeping accommodation for babies – environment, safety factors, types of beds, bed linen, care of nursery.
34. Appearance, growth, and development of infants	a) Emotional, physical, and mental characteristics; need for care, comfort, and love; heredity and environment.
35. Routines for children	a) Daily routine for baby – preparation, importance; preschool children's routines – dressing and undressing, assuming responsibility (e.g., putting away clothes and toys), toilet habits.
36. Disorders and disease prevention and control	<p>a) Proper hand washing; how germs are spread; forms of disease prevention; disinfection; sterilization; hospital housekeeping; communicable diseases; community sanitation measures;</p> <p>b) hand-washing technique; conditions for bacterial growth; some signs and symptoms of illness; clean and dirty areas in the home; wet and dry sterilization in the home; garbage disposal;</p> <p>c) types of infant disorders (teething, cradle cap, cleft palate, etc.); administering medication; controlling communicable diseases.</p>
37. Basic first aid	<p>a) Meaning of first aid; accident prevention; emergency measures for choking, burns, fractures, sprains, poisoning, wounds, seizures, heart attacks; setting up a first aid kit;</p> <p>b) emergency procedures; safety in the home; applying non-sterile dressing, arm sling, pressure bandage; cleaning a minor wound; improvising a splint.</p>
38. Basic nutrition and diet	<p>a) Canada's Food Guide; importance of breakfast; nutritious snacking; essential nutrients; introduction to therapeutic diets; setting up and serving the food tray;</p> <p>b) a well-balanced diet; the four food groups in meal planning; sources and functions of basic nutrients; preparing clear and full fluids and soft diet;</p>

	c) diet from birth to one year – formula and breast-feeding, types of milk, calculating formulas, vitamins, introducing solids, feeding procedures; purpose of food for the growing child; sources and function of food.
39. Food purchasing and storage	a) Family food budgets; freezer food plans; purchasing food for storage and freezing; shopping practices and shopping lists; handling food in the home; comparison shopping; food spoilage – causes, control, food poisoning.
40. Preschool care	a) Baby-sitting in a home; nursery schools; day care centres.
41. Infant and child care	a) Responsible baby-sitting; characteristics of a newborn; child safety; bathing, diapering, dressing, feeding, preparing formula; introducing solids; taking temperature rectally; using tepid sponge to reduce fever; using vaporizer; when to call the doctor; needs of infants; meaning of parenthood; b) care of the newborn; breast-feeding and bottle-feeding; needs of children; stages of childhood; working with children; care of the sick child; understanding the disabled child.
42. Growth and development of preschool children	a) Behaviour; physical, emotional, and social needs; discipline and punishment; home environment; common fears; common problems (bed wetting, tantrums); common diseases; immunization; basic child psychology.
43. Understanding young children	a) Normal growth and development of toddlers and preschoolers; safety precautions; everyday care; crying and comforting; b) common problems; discipline and guidance; understanding needs of the disabled child; childhood diseases; immunization.
44. Introductory child care aide skills	a) From dependent infant to independent school age child; child care aide as a rewarding occupation; safety and health responsibilities; supervising outdoor play and indoor activities; staff relations and communications; b) assisting in learning situations (social, language, art, music, science, math); supervising eating; self-help skills and rest routines; community involvement; aide's personal growth.

45. Community services

- a) Types and functions of resources in the community;
- b) emergency services, poison control, community information services, Children's Aid Society, CNIB, centres for the deaf, distress centres, Meals-on-Wheels, public health department, St. John Ambulance, local day care centres, nursing homes and hospitals; proper use of telephone directory to locate sources of local information.

46. Personal hygiene

- a) Cleanliness – bathing, shampooing, shaving, caring for skin, nails, feet, and teeth; grooming – appearance, make-up, hair-style, selection of clothing; graceful, safe, and efficient body mechanics in performing tasks; lifestyle – balanced diet, exercise, elimination;
- b) relationship between physical and mental health; menstrual cycle; daily personal habits; body language.

47. Bacteriology

- a) Importance of hand washing; causes of disease; communicable diseases and infections; concurrent cleaning and storage of equipment; terminal cleaning of a care-receiver's unit;
- b) importance of hand washing; history of infection control; medical asepsis; pathogenic and non-pathogenic micro-organisms; sterilization – use of pelton sterilizer and autoclave; isolation technique.

48. Human anatomy

- a) Definitions of cells, tissues, organs; body senses; structure and function of body systems – skeletal, integumentary, digestive, urinary;
- b) anatomical features of the body; the eye and the ear; structure and function of body systems – muscular, nervous, respiratory, endocrine.

49. Wilderness travel

- a) Using a compass; estimating distance, direction, and travel times; establishing and maintaining a safe and comfortable temporary camp; proper campfire techniques; guiding skills; planning a wilderness trip;
- b) interpreting maps and orienteering; selecting campsites;
- c) water travel; knowledge of local flora, fauna, and terrain features;
- d) pacing a specific distance;

	e) specifications for and use and maintenance of bush- and water-travel equipment, camping equipment, and clothing; camp cooking.
50. Hunting and fishing guide	a) Laws regulating hunting, fishing, and trapping of game; b) techniques for locating, harvesting, preparing, and transporting fish and game; identifying local landmarks and topographic features; maintaining good customer relations and an organized schedule; c) wilderness travel skills; d) local environmental concerns.
51. Safety in guiding and tourist services	a) Safe use of camping tools and equipment; fire safety and control; safe storage and transportation of fuels; safe practices in wilderness and water travel; b) safe use of hunting and fishing equipment.
52. Tourism – local information	a) Types of aircraft and local air service patterns; water, rail, and bus services; dining facilities; b) local accommodations for visitors; c) recreational features and other attractions; classifications of hotels, resorts, and other local accommodations for visitors; d) shopping services; foreign currency exchange, banking, and insurance services; interpreting, telecommunication, and postal services; emergency services; health care services; transportation; e) rental services – vehicles and other modes of transportation; f) local crafts and products.
53. Tourist services	a) Interpreting air and ground transportation schedules; using the twenty-four-hour clock; travel documents; types of insurance for travellers; arranging reservations; b) recognizing the tourist industry infrastructure – identifying the interdependence of tourist service operations; RCMP tourist-alert program; air cargo requirements; c) tourism organizations and publications; travel industry contracts; legal responsibilities; using a PA system; d) computer applications in the tourist industry; protecting the interest of clients; e) guided tours.

54. Tourist industry – public relations and communications

- a) Identifying public relations objectives and the desired image of a tourist service; preparing promotional material for a tourist service; completing sample forms used by the travel industry;
- b) giving and receiving messages for clients;
- c) preparing a presentation, greeting prospective clients;
- d) planning a brochure; news releases or reports for a tourist service; demonstrating or explaining a service; budgeting a tourist service;
- e) planning a brochure;
- f) techniques for selling retail and trade.

55. Major legislation affecting tourism

- a) Travel agent legislation; human rights legislation; customs regulations; regulations on entry of aircraft and boats; regulations on entry of guns and cameras; provincial liquor regulations; Canadian driving regulations;
 - b) provincial hotel regulations; provincial campground and trailer regulations; foreign insurance regulations.
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Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
4. Food Services Grouping	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
	Elements of Technology*	Sr	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Cosmetology (Grades 9-12)

Guiding and Tourist Services (Grades 9-12)

Home Nursing, Child Care, and Health Care Services (Grades 9-12)



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Curriculum Guideline

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Technological Studies

*Intermediate and
Senior Divisions*

Part B
10. Textiles
Grouping

Module 1, 1986



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Summary of Core Content for Courses in the Textiles Grouping

Course Content for the Textiles Grouping

Appendix

Courses in Technological Studies (by Subject Grouping)

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Introduction to the Textiles Grouping

The technological studies curriculum guideline consists of three parts: *Part A: Policy for Program Planning*, Part B, which is structured into ten subject groupings, and *Part C: Ontario Academic Courses (OACs)*. Part A provides essential background for the planning of all courses in technological studies. The following three sections in Part A are especially important in this regard: "The Aims of Technological Studies", "Program Requirements", and "Course Planning at the Department Level" (including the evaluation of both student achievement and the program). The ten subject groupings of Part B are listed in the Appendix of this document, along with the individual subjects and authorized courses. Each subject grouping in Part B is to be treated as a separate component.

Subject grouping

This document is designated as Module 1 for the textiles grouping. The grouping includes three subjects: sewing and clothing construction, textile maintenance and servicing, and upholstery. Additional modules for this grouping will appear in the future.

Students may enrol in courses derived from this document for a variety of reasons. For most students, such enrolment will be the initial introduction to one of the occupational areas within the textiles grouping. For some, it will be the first step towards an apprenticeship in the textile maintenance and service industry. For others, it will be an introduction to other occupations in the textile industry, such as sewing or upholstery. While each of the three subjects outlined in this document deals with content that is unique, each also involves basic concepts that are common to the subject grouping. For career-planning purposes, students taking courses under any of these three subjects should gain some insight into the other subjects.

Subject sections

Separate sections are provided in each subject for planning basic and general level courses. Each section includes aims and suggestions to assist teachers with course planning. Courses must include the skills and knowledge outlined as core content for each section. This core content is identified in chart form. All of the

core content indicated for a particular level of difficulty must be included, either in one course or in the sequence of courses for the division.

Although in many cases the core content for the different grades and levels of difficulty is derived from the same units, the depth and breadth of treatment of this content material will vary according to the grade and level of the course. It is expected that the content will be developed to a depth that is appropriate to each level of difficulty and that teaching strategies, projects, and evaluation methods will reflect both the level of difficulty and the grade for which the course is planned.

Course objectives

All courses will be planned to achieve specific objectives, which should be based on the aims for courses at the basic and general levels. The nature of the aims is such that teachers can set learning objectives for each aim according to the grade and ability of the students. The depth and breadth of students' knowledge and skill competence, with respect to the core learning, will increase through successive courses.

Together, the aims, learning objectives, and core content constitute the essential learning for a course. Any remaining course time can be structured to amplify the core learning and/or enrich the course with optional content. Additional topics that are appropriate to particular objectives and course themes may be selected from the section entitled "Course Content for the Textiles Grouping", at the end of this module, or from the course content listed at the end of any other module in Part B.

Course content (charts)

Charts are used to specify the core content, by division and level of difficulty, for each subject in the textiles grouping. The content units listed on the charts correspond to the numbered items listed in "Course Content for the Textiles Grouping". The letters *a*, *b*, *c*, and so on represent subunits of the content units.

Chart 10.1.7 provides a summary of the core content for all courses in the textiles grouping. This summary chart is a convenient means of identifying what should be taught, comparing core content requirements for different levels of difficulty in a subject, and identifying content that subjects have in common.

Program and course planning

The total time of the course or sequence of courses offered in a subject at any particular level of difficulty over the two-year period of Grades 9 and 10 or Grades 11 and 12 must be a minimum of 55 hours. Where the total time available to the courses in the two-year period exceeds 110 hours, additional content will have to be included to supplement the core learning. The additional topics that are selected must support the course objectives. These topics may be selected from units listed in "Course Content for the Textiles Grouping". Topics appropriate to particular course themes may also be selected from the content for related subject groupings. For example, content from the woodwork section in the construction grouping may be incorporated into the upholstery program if appropriate to a particular theme or project.

Where schools offer courses in two or more subjects of this grouping, there is a need to structure the courses to avoid significant overlaps in course content. Although two such courses may mutually reinforce basic concepts in textiles, the types of materials, equipment, and shop challenges that students experience in each course should reflect applications commonly associated with the particular subject field. The student who successfully completes courses in two subjects of this grouping should have an increased awareness of the types of occupational activities, working materials, and equipment associated with each subject as well as a feeling for the relationship between the subjects and for future trends in the field.

Bi-level and bi-grade classes

Classes that combine groups of students taking courses at different levels of difficulty (e.g., Grade 9 sewing and clothing construction, basic and general levels) or at different grade levels (e.g., upholstery, Grades 11 and 12) are likely to become more common. Although

the teaching strategies and techniques for assessing student progress in bi-level and bi-grade classes may present some special challenges to the teacher, the extra effort is worthwhile: by combining classes, schools can offer courses that would otherwise be impractical because of small enrolments.

Teaching strategies that work well in bi-level classes recognize the fundamental differences in course requirements for students at the two levels. Common lessons should be concise and focus on practical aspects of the subject. Practical assignments should lead to independent studies that develop knowledge and skill at the appropriate level of difficulty. Supplementary lessons should be short, should have different emphases for the two levels, and should lead to practical activities that are different for the two groups. Successful strategies involve students in self-directed work and research projects of a limited length. Group activity in a simulated work environment can both reinforce subject content and develop social skills such as co-operation and responsibility.

Evaluation

Courses based on this module are to a large extent skills oriented. As students develop these skills, they are motivated to acquire related knowledge and the attitudes they will need to apply their skills in work situations. The skills are reflected in the performance objectives set by the teacher when planning the course. It is against these performance objectives (which set the expected standards of achievement for the particular grade and level of difficulty of the course) that student achievement is measured.

Evaluation of student achievement in skill development involves assessment of both the process and the product of the skill. Checklists are commonly used to identify the operational steps of the process, whether it is upholstering a footstool or pressing a pair of pants. Significant aspects of the completed product or operation are identified and commonly assessed with rating scales. When the checklists and rating scales are available to students, they can use them for self-evaluation as they strive

for acceptable standards of competence. Comparisons of the teacher's evaluation of a skill and the student's self-evaluation can often clarify the standards that are expected. Performance tests are a valid and effective method for assessing the achievement of a skill.

The success students have in acquiring theoretical knowledge and understanding in textile courses can be assessed through tests and examinations. A variety of assessment techniques, including short oral tests, objective tests (e.g., true-false and multiple-choice), short-answer completion, and regular question-and-answer tests, should be applied in the evaluation process. Written tests should be designed to suit the reading and writing levels of the students. The vocabulary used in the test questions should reflect that used in the classroom. Although students should be encouraged to write answers in proper sentence form, questions and answers that involve diagrams are effective assessment instruments in technological studies.

The development of desirable attitudes and the ability to combine skill and knowledge successfully in practical work tasks are demonstrated by students in their planning and implementation of projects, work assignments, and problem-solving activities. Teacher observation of the student's achievement on such assignments is a valid technique for assessing progress in these areas.

Additional comments about the evaluation of student achievement and some suggestions

related to the evaluation of programs in technological studies are outlined on page 24 of *Technological Studies, Part A: Policy for Program Planning*.

Computer software

As computers and appropriate software become available to schools, opportunities for students to successfully accomplish independent study activities will increase. The confidence gained from these experiences is particularly important to today's young people, who face a working life characterized by changing technology and the need to continually update their skills and knowledge.

The effective use of computer programs as learning tools in the classroom can require adjustments in teaching strategies. Students continue to need hands-on experiences with the materials, tools, and equipment associated with courses in this grouping, but computer programs applied at appropriate times can help the teacher to teach, reinforce, review, and test the associated learning.

Students should also have opportunities to become aware of the various tasks that computer technology performs in the production and service industries associated with subjects in this grouping. Visits to these industries and related institutional training centres can show students how computer technology is used to facilitate access to information and to control functions related to sewing, cutting, designing, and pattern development.

Sewing and Clothing Construction

Intermediate Division

(Grades 9 and 10)

Courses in sewing and clothing construction for the Intermediate Division introduce students to the basic skills and knowledge required for the construction of garments. The equipment and materials used in the courses are used in dressmaking, tailoring, and other sewing occupations. What is learned in these courses can be applied directly to personal sewing and clothing construction. It can also provide useful background for students who plan to pursue further studies in fields related to the textile and clothing industries.

Courses in sewing and clothing construction are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 10.1.1 identifies the core content for these levels. The aims and suggestions for designing

courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, fabrics, sewing equipment, and layout and cutting of materials.

Chart 10.1.1
Core Content for
Sewing and
Clothing
Construction
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	efg	efg
3. Sewing equipment	cd	cd
4. Fabrics	ceh	ceh
7. Layout and cutting of materials	ab	ab
32. Sales techniques and marketing		a
33. Job opportunities	a	a
38. Stain and soil removal	a	a
44. Minor repairs and alterations		a
45. Pressing equipment	a	a
46. Sewing – hand and machine stitches	ab	ab
47. Patterns	ac	abc
48. Clothing construction techniques	a	ad
51. Fitting of clothing		b
52. Personal wardrobe		a
53. Mass production – clothing construction		a
55. The textile industry		a

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXS1B for Grade 9 and TXS2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits when using tools and equipment to cut, sew, and press textiles;
- develop clean, neat, orderly habits when using and storing equipment and supplies in the shop;
- develop skill in the safe use and care of power and domestic sewing machines and pressing equipment;
- acquire the basic techniques of clothing construction for personal use;
- develop pride in the quality of the unique textile products they create;
- acquire knowledge of common textile fibres and fabrics;
- develop the ability to understand and implement written and oral instructions and to use correctly the basic terminology of sewing and clothing construction;
- acquire knowledge of careers and further training opportunities in sewing and the clothing industry.

Suggestions for Teachers

Grade 9 courses based on this section should be planned to allow students to accomplish the core learning with an emphasis on personal sewing projects. Grade 10 courses should allow students to explore more widely the personal and vocational uses of sewing and clothing construction.

In Grade 9, the learning activities for students should be structured around the construction of a simple garment such as rugger pants. Additional projects should reinforce and extend this learning and should reflect as much as possible the students' interests. On these projects, students should work with industrial sewing machines if possible. Where facilities permit, students should have experience on both industrial and domestic machines.

Personal projects in Grade 10 can include pants or slacks, vests, skirts, and sleeveless blouses. Practice in altering patterns for these garments to accommodate individual measurements, and testing alternative pattern layouts on the fabric, should be part of the teaching strategy for these courses.

Teachers may find it necessary to modify the content of courses to suit limitations in facilities. On the other hand, if equipment that

could enhance a course is available, the teacher may include appropriate units or topics that take advantage of this equipment.

Whenever possible, topics in Grade 10 courses should be related to occupational activities in commercial sewing situations such as garment factories, specialized sewing-workrooms, and tailor and dressmaker shops. Themes such as alterations and repairs and drapery production, or other themes listed in unit 54(b) on page 42, should be used as teaching strategies for this purpose. Some themes can be planned to support group sewing projects.

Mass production can be staged in two different ways: the finished product can be a single large project, such as a tent or a set of drapes, on which several students have worked, or it can be a large number of small items, such as shop aprons, for each of which every student has produced a certain part. In either case, the opportunity for developing co-operation and leadership qualities is present.

To accommodate particular themes, course content related to one or more crafts such as those listed in unit 54(c) may be included as well. Techniques that students can employ

for locating and using specific information that may be required for these themes should be emphasized. In the long term, the process of acquiring the information is more important than the information itself.

Courses offered to students who plan to seek employment in the clothing construction field must provide them with opportunities to acquire skills that are basic to the trade. Students also require basic knowledge of the principles, concepts, and terminology associated with the subject, in order to be able to solve related problems and extend their learning in the subject field. When introducing the core content for these courses, teachers

should emphasize objectives related to units 1 ("Safety"), 3 ("Sewing equipment"), 46 ("Sewing – hand and machine stitches"), and 48 ("Clothing construction techniques").

The evaluation of student achievement in courses planned for the basic level of difficulty must reflect the emphasis on practical activity. Approximately 70 per cent of the student's final mark should be based on practical achievements. It should be made clear to students at the outset that there are tolerance limits on all phases of their projects. These limits should be identified for each project and used as criteria for assessment.

General Level

Course codes assigned to general level courses planned under this section will be TXS1G for Grade 9 and TXS2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe habits in the use of cutting, sewing, and pressing equipment and an awareness of the need to follow safety procedures in all work activities;
- learn to store and use equipment and supplies so as to prevent accidents and fire;
- acquire techniques and knowledge fundamental to sewing and clothing construction;
- develop skills in the proper use and care of power sewing machines, pressing equipment, and electric cutters;

- create a unique article of clothing to fit a particular individual;
- acquire knowledge about textile fibres and fabrics and their applications;
- improve skills in communicating about clothing construction;
- explore careers and further training opportunities in sewing, clothing, and the textile industry.

Suggestions for Teachers

Courses planned at the general level of difficulty can provide students with a comprehensive introduction to sewing and clothing construction as a background for further study in the Senior Division and possible vocational or personal use. The courses may also be related to courses in business or art for students who intend to pursue postsecondary studies and possible employment in professions linked to the textile or clothing industry. The courses may emphasize industrial and/or domestic sewing but should provide students with a broad perspective on the subject.

To provide an overview of the textile and clothing industries, teachers may include pertinent aspects of the other subjects in this grouping – upholstery and textile maintenance and servicing. Marketing and other business aspects of the sewing, clothing construction, and fashion industries should be related to business studies wherever possible. Similarly, the applied science associated with textile fibres and fabrics should be related to science-course content whenever possible. This reinforcement not only demonstrates the relationship between subjects but also helps students

to make decisions about Senior Division courses and careers.

Comments in "Suggestions for Teachers" for the basic level in this subject can be adapted to general level courses based on this section. In particular, the suggestions about project work and the use of themes such as those listed in unit 54(b) ("Crafts with textiles") may be adapted as teaching strategies in general level courses.

At the general level, more objectives than at the basic level should concern the acquisition of specific knowledge associated with selected themes. Techniques of acquiring information can also be more varied.

For some themes, equipment may not be available in the shop. Where theme-related information, equipment, machines, and materials are available as a resource outside the shop, students should be encouraged through assignments and projects to take advantage

of them. The exercise of appropriate safety precautions is an essential component of such activities.

Students should be encouraged in their project work to make creative modifications. These may range from aesthetic trim features to functional changes that require some simple pattern drafting. In general, design efforts can be directed towards the solution of a perceived problem (e.g., the need to make the wearer of the garment look taller or thinner). Where the design aspect is a component of the project assignment, the functional and aesthetic contributions of the design should be included in the assessment of the project. Where design is not a requirement, bonus marks may be awarded for original design contributions.

In planning teaching strategies for bi-level classes that include basic and general level students, teachers may find the suggestions outlined on page 2 of this document to be of assistance.

Sewing and Clothing Construction

Senior Division

(Grades 11 and 12)

Senior Division courses in sewing and clothing construction can serve a variety of student goals. One goal is the acquisition of the skill and knowledge necessary for employment in entry occupations in textile sewing and clothing production and marketing. Another goal is postsecondary study leading to occupations in production, design, management, marketing, technological, or other aspects of the textile sewing and clothing construction industries. A third goal, and one that all students who take these courses should be able to meet, is the development of practical skills for personal use.

Courses in sewing and clothing construction are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 10.1.2

identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 440 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, sewing equipment, fabrics, layout and cutting of materials, and patterns.

Chart 10.1.2
Core Content for
Sewing and Clothing
Construction
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	efg	efg
3. Sewing equipment	d	bd
4. Fabrics	cehim	cehijm
7. Layout and cutting of materials	abc	abc
30. History of the trade		c
31. Management	cf	cef
32. Sales techniques and marketing	ab	abc
33. Job opportunities	a	abc
34. Computers in industry		a
35. Supplies and materials	c	c
38. Stain and soil removal	a	a
44. Minor repairs and alterations	ab	abc
45. Pressing equipment	ab	ab
46. Sewing – hand and machine stitches	abcd	abcd
47. Patterns	bce	bcdef
48. Clothing construction techniques	ab	bcd
49. Design in clothing	a	ab
50. Industrial machines	a	a
51. Fitting of clothing	ab	abc

Content Units	Core Content for Courses	
	Basic	General
52. Personal wardrobe	a	a
53. Mass production – clothing construction	a	ab
54. Crafts with textiles	a	a
55. The textile industry	ab	bc

See “Course Content for the Textiles Grouping”, beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXS3B for Grade 11 and TXS4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop an awareness of safety procedures to be followed in work with sharp tools, powered equipment, steam, and flammable materials;
- acquire skill in the use and care of domestic and industrial sewing machines and other specialized equipment used in the fabrication of textile products;
- acquire sewing techniques and knowledge and skill in methods of clothing construction;
- study the effects of colour and design in clothing;
- create or modify an article of clothing to fit a particular individual;
- acquire knowledge of the origin, production, and characteristics of common textile fibres and fabrics;
- develop attitudes of respect and co-operation towards peers and supervisors in work situations;
- develop positive attitudes towards good work habits and pride in the quality of their work;
- acquire insights into the planning and care of a personal wardrobe;
- improve skills in communicating about sewing and clothing construction;
- explore occupations in the sewing and clothing construction industries and acquire insights into employment and further training opportunities.

Suggestions for Teachers

Courses planned for Grades 11 and 12 should provide preparation for students who wish to enter the work force in the clothing production or textile sewing industry. Students should also be able to use the knowledge and skills they acquire in these courses for the personal purposes of creating and maintaining their own clothing and as background for other occupations such as retail sales of textiles or clothing.

In Grade 11, the products may be planned for personal use but created in a businesslike classroom atmosphere that simulates the

workplace. Unit construction and firm deadlines for projects can prepare students for the discipline of the workplace. Occupational themes such as dressmaking, tailoring, garment alterations (for a department store), or mending and sewing repairs (for a dry-cleaning shop) can serve as teaching strategies for this type of project work. The importance of efficient work habits should be discussed with the students, and they should be taught time-saving shortcuts when possible.

Personal projects in Grade 11 should include garments with sleeves, collars, and machine-made buttonholes. Grade 12 projects may

include tailored garments and dressmaker suits that involve construction units such as patch pockets, set-in pockets, and bound button-holes. Assessment of student achievement on these tasks, as well as on alterations and repairs, should take into account not only the sophistication of the task but also the self-assurance of the student and the speed with which the work is accomplished.

Projects involving knit fabrics should not only provide opportunities for developing techniques appropriate to these specialized fabrics but should also probe structural features and other characteristics of the various knit types. Students should acquire some awareness of the various synthetic fibres, in addition to cotton and wool, and of the trade names associated with these knits.

Activities that support the applied-science aspects of cotton, linen, silk, and wool should emphasize comparative investigations of these fabrics. Aspects that can be explored include the materials from which the fibres originate, processes involved in production of the textiles, characteristics of the fibres, and the range of fabric types and their potential applications.

Some content topics are specified in the core learning for both Intermediate and Senior Division courses. Most topics will be covered more than once in the sequence of courses planned for the Intermediate and Senior programs in sewing and clothing construction. Such topics should be studied at progressively greater depth and breadth in successive courses in the sequence.

Suggestions outlined for basic level courses in the Intermediate Division should be reviewed. In particular, comments about course objectives, themes, projects, and evaluation of student achievement may be adapted for Senior Division courses.

Like occupational themes, themes related to school events can provide opportunities for attaining course objectives. School events such as open houses, plays, and fashion shows provide opportunities for sewing such items as

stage props, costumes, and personal clothing. All such projects give students a chance to participate in a group activity, make design decisions, maintain work schedules, and meet deadlines.

Several of the themes identified in unit 54(b) can be planned to support objectives related to group activity. Projects may involve simulation of the mass production of a particular textile product, with each member of a team performing the required procedures, such as layout, cutting, marking, sewing, and pressing, for one stage of the overall production. Alternatively, projects may require joint effort by all members of a team in the completion of one large item such as a quilt, a set of home accessories, or a set of draperies. On group projects, students need to be encouraged to work independently on assigned tasks and to assume leadership roles in assisting other students.

Clothing construction projects involving the creation or alteration of clothing to fit the individual provide many opportunities for discussion of short- and long-term clothing care. The theme of planning a wardrobe can also provide opportunities to consider design in clothing and its use in the solution of an individual's clothing problems. Where time permits, some students may undertake pattern drafting projects in which they adapt an existing pattern or design a new one for a particular purpose. Additional content for this design activity may be selected from unit 49 ("Design in clothing").

Safety is an important aspect of all work activities. The development of a general safety awareness and the cultivation of good work habits and safe work procedures in the sewing workroom should be related to typical on-the-job experiences wherever possible. Ideally, what students learn about safety should transfer readily to all other activities in which they are involved.

Work experience can benefit students at any stage of their Senior Division course work. Early work experiences may be used effectively to allow students to explore careers; later experiences can be used to reinforce

and further develop course objectives. Co-operative education or part-time work in a job related to sewing and clothing construction can improve students' chances for employment and career success within this field after graduation.

Teachers should attempt to maintain communication links with local business enterprises and college departments that are involved in activities related to sewing and clothing construction. Liaison with local business and industry can lead to a better understanding on the part of students of the value of their training in school and of what employers expect from a new employee.

Careers in the clothing industry include much more than just factory piecework. It is important for teachers to expand students' awareness of the range of occupational opportunities available to graduates of this course. Invited guests from the clothing industry can provide

valuable insights into occupations in the industry.

Where possible, teachers should make arrangements for students to visit factories to see computerized pattern layout and other production methods.

Students who intend to enter the field of textiles will benefit from projects such as making alterations, making drapes, and doing repairs. The production of small items in a simulated business (in which each student is responsible for the whole process of design, production, advertising, costing, sales, etc.) is a desirable experience for interested students.

There are further suggestions in the general level section, which should be reviewed when planning courses at this level of difficulty.

General Level

Course codes assigned to general level courses planned under this section will be TXS3G for Grade 11 and TXS4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- develop an awareness of the need for proper safety procedures in all work and leisure activities;
- develop dexterity in the use of hand tools and power equipment to sew textiles;
- learn sewing techniques and clothing construction methods and use them confidently in the creation of clothing items;
- develop knowledge and skill in the basics of clothing design;
- create clothing to suit a particular individual;
- acquire knowledge of the scientific properties and potential applications of common textile fibres and fabrics;
- develop leadership skills and work co-operatively on the job with peers and supervisors;
- critically evaluate their own work and develop pride in its quality;
- acquire insights about the planning and care of a personal wardrobe;
- improve their skills in communicating about clothing construction and sewing;
- acquire a perspective on the sewing and clothing construction industries and knowledge about related occupations and training opportunities.

Suggestions for Teachers

General level courses based on this section should provide a balance between the theoretical and the practical aspects of the core learning. The project approach is a means to this balance. Independent study associated with a project can be undertaken by students to pursue one or more theoretical aspects of the practical project, such as design considerations, scientific properties of the materials or process, marketing, and alternative production methods used in industry. The theoretical learning should establish a base for further studies. In combination with skills development, it can also provide an opportunity for students to explore in greater depth their interests in and aptitudes for specialized occupational areas of the industry. Some students may seek detailed information about self-employment as a tailor, dressmaker, or operator of a textile product business. Others may pursue design aspects of the industry. All will acquire for personal use a broad range of skills and information about sewing and clothing construction.

In planning general level courses for the Senior Division, teachers can adapt the suggestions offered in the sections on general level courses for Grades 9 and 10 and basic level courses for Grades 11 and 12. Where sufficient course time is available, there is wide scope for extending the core learning and including additional topics from the course content for the textiles grouping (list begins on page 30). These topics can be selected to support particular projects or to broaden the themes being developed.

Problem solving should be an aspect of most projects for the general level. The problems can become more challenging as the students become more sophisticated. Students should be encouraged to maintain a record for each project, in which they outline the information they have acquired or developed, alternative solutions they have explored, decisions they have made about the project, and evaluative

comments on their final product. In addition to texts and resource books, trade publications for the textile, sewing, and clothing industries should be made available to students, to support and stimulate learning. When available, trade fairs, exhibitions, fashion shows, and seminars can also be stimulating resources.

Students may wish to undertake, in addition to major themes related to clothing construction, a theme related to the design and sewing of other textile articles. One example, indicated in 54(b), would be canvas products that are designed for carrying, supporting, or protecting things. The mass production and marketing of good canvas product designs may also be explored as a simulated business activity involving groups of students.

Conducting a survey of community businesses that are involved in some aspect of textile sewing, clothing construction, or clothing design or that provide a service for these industries can give students a perspective on the textile industry in their community. It can also provide new contacts. A survey of this type may be undertaken as a long-term class activity.

The development of career information is an ongoing component of all courses based on this section. Students interested in self-employment or in a role in the design or management area of the industry should be encouraged to take relevant courses in subjects such as business education, art, and design. In addition, opportunities should be planned for students to become familiar with the post-secondary programs that are available to graduates who wish to continue their learning in these occupational areas.

Textile Maintenance and Servicing

Intermediate Division

(Grades 9 and 10)

Courses in textile maintenance and servicing in the Intermediate Division introduce students to exploratory experiences, skills, and knowledge associated with commercial dry-cleaning and laundering industries that service the textile field. Students also acquire an overview of the textile industry, particularly those aspects related to other subjects in this grouping.

Courses in textile maintenance and servicing are authorized for Grades 9 and 10 at basic and general levels of difficulty. Chart 10.1.3 identifies the core content for these levels. The aims and suggestions for designing

courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Intermediate Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 440 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, fabrics, stain and soil removal, and finishing (pressing).

Chart 10.1.3
Core Content for
Textile Maintenance
and Servicing
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	b	bc
4. Fabrics	c	cd
30. History of the trade		b
31. Management	d	e
33. Job opportunities	b	b
36. Plant layout	a	b
37. Dry-cleaning and laundry systems	a	ab
38. Stain and soil removal	a	ab
39. Finishing (pressing)	a	ab
40. Goods in process	a	b
55. The textile industry		a

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXM1B for Grade 9 and TXM2B for Grade 10.

Aims	<p>In all courses based on this section, students will have the opportunity to:</p> <ul style="list-style-type: none">– develop an awareness of good safety habits;– develop basic skills in the use of hand and production equipment for maintaining and servicing textiles;– develop a co-operative attitude towards co-workers and a sense of responsibility	<p>towards work commitments and the community;</p> <ul style="list-style-type: none">– discover personal aptitudes and interests in an industry that provides an essential service for society;– acquire knowledge of career opportunities in the textile servicing and maintenance field.
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Suggestions for Teachers

Course objectives planned by the teacher to accomplish the core learning may be supported by additional topics selected from units 1 to 4 and 29 to 43, which are listed at the end of this module. Topics from these units may also be used to enhance major themes that are used as teaching strategies. Pertinent topics associated with other subjects in this grouping may also be included in these courses as appropriate, to provide a broader perspective on the textile maintenance and servicing field.

Exploratory courses offered in Grade 9 should be planned to allow students to accomplish the core learning with an emphasis on textile servicing techniques and practical production methods. Where shop facilities are too limited to support the complete core content, the course may be structured to support appropriate themes related to the available equipment. In well-equipped shops, where equipment is available to facilitate learning experiences in addition to the specified core learning, related optional topics may be included as required to support course objectives.

Objectives related to skill development at the basic level of difficulty in Grades 9 and 10 should be fostered through practical activities and project work. Repeated opportunities of this type should be provided for students who plan to work in the trade so that they may thoroughly master the basic skills and knowledge that are fundamental to continued learning in this field. An emphasis on practical applications also develops the production skills that can benefit students in their transition to employment.

The learning of skills and theory that takes place during practical activities should receive recognition in the evaluation of student achievement. The criteria for assessing achievement should be established in advance for all phases of student projects and major assignments. It is important that students understand these criteria at the beginning of each assignment.

General Level

Course codes assigned to general level courses planned under this section will be TXM1G for Grade 9 and TXM2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire safe working habits and a positive attitude towards the safety of others;
- develop basic skill and knowledge in the use of hand and production equipment associated with textile maintenance and servicing;
- acquire information about common textile fibres and fabrics that bears on their servicing requirements;
- develop a co-operative attitude towards co-workers and a sense of responsibility towards work commitments and the community;
- discover personal aptitudes and interests in textile-related occupations;
- acquire knowledge of employment and further training opportunities in the industry.

Suggestions for Teachers

Courses planned for the general level should reflect a balance between theoretical and applied activity. These courses should aim at stimulating student interest in further study and a possible career in the textile maintenance and service field. Theory lessons should be complemented by interesting and relevant practical projects.

Suggestions provided in the section for basic level courses can be adapted to general level courses. This approach is particularly appropriate in bi-level classes that include basic and general level students. Suggestions for teaching bi-level classes appear on page 2 of this document.

In addition to the core topics specified for general level courses in Grades 9 and 10, enrichment topics in textile maintenance and servicing may be selected from unit 29 (applied science) and from any of units 32 to 44, outlined in "Course Content for the Textiles Grouping", beginning on page 30. Topics on management in unit 31 and on fabrics in unit 4 should receive more emphasis in general level courses than in basic level courses. Students can achieve much of the theoretical learning related to these units through practical activities that require some independent study.

Textile Maintenance and Servicing

Senior Division

(Grades 11 and 12)

Courses in textile maintenance and servicing in the Senior Division provide students with skills, knowledge, and work experiences that can prepare them for entry into and further training in occupations associated with commercial dry-cleaning and laundering industries. Students may apply the learning in these courses to both vocational and personal goals.

The principles and processes of servicing regular garments may be extended to specialized items in some courses. These items might include special forms of wearing apparel, textiles, laminated fabrics, and covering materials used on surfaces and furnishings.

Courses in textile maintenance and servicing are authorized for Grades 11 and 12 at basic and general levels of difficulty. Chart 10.1.4

identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 440 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, fabrics, dry-cleaning and laundry systems, stain and soil removal, finishing (pressing), and minor repairs and alterations.

Chart 10.1.4
Core Content for
Textile Maintenance
and Servicing
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	bcd	bcde
4. Fabrics	de	ef
30. History of the trade	b	b
31. Management	f	fg
32. Sales techniques and marketing	bc	bc
33. Job opportunities	bc	bc
35. Supplies and materials		b
36. Plant layout	c	cd
37. Dry-cleaning and laundry systems	c	cd
38. Stain and soil removal	cd	ce
39. Finishing (pressing)	c	d
40. Goods in process	c	d
44. Minor repairs and alterations	a	
55. The textile industry	ab	bc

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXM3B for Grade 11 and TXM4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire skills in the proper operation and maintenance of equipment commonly used in maintaining and servicing textiles;
- acquire pride in successfully applying learning to a work task;
- develop skill in solving common processing problems related to the maintenance and servicing of textiles;
- acquire responsible attitudes towards work commitments, customers' needs, property, and safety in the workplace;
- recognize the need to co-operate with fellow workers in order to accomplish work tasks effectively;
- discover and explore opportunities for employment and further training in the textile maintenance and servicing industry.

Suggestions for Teachers

Senior Division courses should be planned to build on the Intermediate Division core learning, extending the base of knowledge and skills to enable students to solve typical problems associated with common processing and production systems in the workplace.

Teaching strategies can be structured around themes related to production systems, types of work activities, or specific projects, depending on course objectives and the availability of equipment and resources. Possible themes include commercial dry cleaning, commercial laundry, specialized shirt laundry, repairs and alterations, and household and specialty items such as institutional draperies, leather garments, and electric blankets. To support particular themes, content topics in addition to the core content may be selected from the units outlined under "Course Content for the Textiles Grouping", beginning on page 30. Topics from unit 4 and from units 28 to 44 are closely related to textile maintenance and servicing and can directly support learning objectives planned for themes in these courses. Strategies should be designed to help students to develop confidence in their performance on required tasks and eventually to assume leadership roles in group tasks.

Work experience can benefit students at any stage of their Senior Division course work. Early work experiences can allow students to explore careers; later experiences can be used

to reinforce and further develop course objectives. Co-operative education or part-time work in a job related to textile maintenance and servicing can improve students' chances for employment and career success.

Students should gain practical experience and proficiency in the finishing skills. They should be able to press heavy garments such as suits, coats, pants, and jackets and fine and delicate garments such as fine silk blouses or dresses. The ability to press a variety of pleats, too, may give students another advantage when they seek employment.

Students should be aware of the variety of job opportunities related to the dry-cleaning and laundry industries. Jobs exist for route and store salespersons, office clerks, markers, dry cleaners and washers, spotters, machine operators, finishers (pressers), inspectors, seamstresses, shippers, and supervisory personnel. Many similar jobs exist in hotels, hospitals, and other institutions that provide their own textile maintenance and servicing. In addition, firms that rent uniforms or other clothing and/or linens require trained personnel.

The average employer in the textile maintenance and servicing field seeks new employees who understand sales techniques, are able to communicate with customers, have a reasonable knowledge of textile servicing techniques

and production methods, and are able to handle cash and to follow management's procedures. Most of these job-related skills can be structured into the learning activities of Senior Division courses.

Some students who undertake career exploration assignments may wish to explore the career implications of the use of new technology in machinery, production methods, textile design, and promotion of services. The range of postsecondary programs in textile service

production systems and related machinery repair should also be explored.

The development of good safety habits should be an ongoing objective of all practical activities in the course. Comments on objectives related to skill development and on evaluation appear under "Suggestions for Teachers" in the basic level section for Intermediate Division courses. These comments should be reviewed and adapted to Senior Division courses.

General Level

Course codes assigned to general level courses planned under this section will be TXM3G for Grade 11 and TXM4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire skill in the use of materials and equipment to maintain and service textiles;
- develop skill in solving problems associated with production systems and the processing of textile goods in a textile maintenance and servicing establishment;
- develop responsible attitudes towards using safe work procedures, maintaining a safe

work environment, co-operating with fellow workers, and meeting commitments and customers' needs;

- acquire knowledge of career opportunities in service industries related to the textile field;
- acquire the knowledge, skills, and confidence required to adapt to technological change in textile servicing.

Suggestions for Teachers

Courses planned for the general level in Senior Division should provide opportunities for students to acquire theoretical basics as useful background for both postsecondary study and self-employment. Practical activities that involve problem-solving exercises and research can nurture this type of learning.

The addition of optional course content such as the topics listed in units 4(c), 31(h), and 34(b) (see the list beginning on page 30) can link student learning to science, computer applications, business, and management activities. Interdepartmental planning in the school can reinforce such links by introducing into related courses appropriate project and content options, forming in effect a school-related package.

Further enrichment for students in general level courses may be derived from active

participation in trade conventions, seminars, and other community activities. Such elective study can be particularly beneficial for students who are interested in self-employment or management roles.

Suggestions provided in the previous section for basic level courses and in the Intermediate Division section for general level courses should be reviewed and adapted where appropriate to courses planned for this section. Course themes can be structured to maintain a balance between theoretical and applied learning. Course objectives and methods of evaluating student achievement should reflect this balance.

Senior Division courses at the basic and general levels may be taught in bi-level classes. Comments and suggestions related to this type of class appear on page 2 of this document.

Upholstery

Intermediate Division

(Grades 9 and 10)

Courses in upholstery introduce students to the basic skills and knowledge of the upholsterer. Students will learn to design and construct furniture and to apply textiles and related fittings and decorations to furniture and the interiors of rooms and vehicles. Related studies of furniture design, construction, and finishing are often included in these courses.

Students may take upholstery courses for either personal or vocational reasons. In either case, they should develop a perspective on career opportunities related to upholstery and other areas of the textile industry.

Courses in upholstery are authorized for Grades 9 and 10 at the basic and general levels of difficulty. Chart 10.1.5 identifies the core

content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 220 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, hand and power tools, sewing equipment, fabrics, padding and cushioning, and layout and cutting of materials.

Chart 10.1.5
Core Content for
Upholstery
Intermediate Division
(Grades 9 and 10)

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
1. Safety	a	a
2. Hand and power tools	a	a
3. Sewing equipment	a	a
4. Fabrics	a	a
5. Padding and cushioning	a	ab
6. Measuring and estimating materials	a	a
7. Layout and cutting of materials	a	a
8. Upholstered furniture seats, backs, arms, and legs	a	a
9. Upholstered furniture frames	a	a
11. Cover application in upholstery	a	a
12. Trimming upholstery	a	a
13. Welting	a	a
14. Bands	a	a
15. Buttons	a	a
16. Cushions		a
17. Skirts		a
18. Edge rolls and hard front edge in upholstery	a	ab

Content Units	Core Content for Courses	
	Basic	General
21. Webbing	a	a
22. Sagless springs and coil springs		a
24. Finishing show-wood in upholstery	a	a
25. Woodworking machines		a
27. Planning decor	a	ab
29. Applied science		a
30. History of the trade		a
31. Management	ac	ac
33. Job opportunities	a	a
55. The textile industry		a

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXU1B for Grade 9 and TXU2B for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits and practices related to job activities and housekeeping in the shop, storage and use of supplies and equipment, prevention and control of fire and accidents, and use of protective clothing and devices;
- develop skills in the safe and effective use of hand and power tools for measuring, cutting, sewing, shaping, and fastening upholstering materials;
- learn upholstering techniques and the related nomenclature;
- exercise the qualities of intellectual curiosity and imagination, which are needed for continued learning, decision making, and problem solving;
- develop self-discipline by learning to arrive on time and with all necessary materials (e.g., notebooks, pens, pencils);
- develop an attitude of respect and co-operation towards fellow workers and supervisors;
- develop the ability to work with others on group projects;
- improve their self-concept by successfully creating a unique upholstered product;
- develop a vocational or avocational interest in upholstery;
- acquire information about careers and further training opportunities in upholstery and a perspective on the place of this industry within the textile field.

Suggestions for Teachers

Upholstery courses planned under this section should introduce students to the skills and knowledge of the upholstery trade and give them related exploratory experiences in woodwork, wood finishing, and sewing. The courses are designed primarily for young people who are interested in becoming upholsterers. Modifications to the courses can be made to accommodate students whose interests are avocational or whose interests and aptitudes suit them for employment in a factory.

Courses offered to students who are planning to seek employment in the upholstery field must provide opportunities to acquire the basic skills of the trade. These students should be made aware that the trade of upholsterer is not a regulated one. Although the quality of the materials used in the manufacturing process is regulated by the Upholstery and Stuffed Articles Act, 1968, the training standards for an apprentice upholsterer are not controlled by a government agency. Trainees in upholstery are responsible only to their employer for their proficiency and rate of progress. Because a provincial training profile (specifying training standards for this trade) is not available, graduates who have a wide knowledge of upholstery and an ability to demonstrate the basic skills have an advantage over job seekers who are narrowly specialized.

In upholstery courses offered at the basic level of difficulty, both knowledge and skill development may be fostered through practical applications. The sequence of student projects and assignments should be planned to develop the core learning progressively. This approach should also build the production skills these students require for an effective transition to employment. The learning achieved in these practical activities should form the primary basis for evaluating student achievement in the course.

Course objectives planned by the teacher to accomplish the core learning may be supported by additional topics selected from units 1 to 35, listed at the end of this module. Topics from these units may be used to enhance any major theme that is used as a teaching strategy. In addition, topics associated with other

subjects in this grouping or from other groupings may be included where appropriate to expand the student's perspective on the textiles and woodworking industries.

In Grade 9, chair and pad seats should be emphasized. Teachers may wish to assign a practice project, such as upholstering a block of wood of approximately $25 \times 100 \times 200$ mm, in order to get students started immediately on a hands-on project. Easy-to-handle fabrics and simple pull-over fabric application should be used. In a ten-week course, teachers should try to assign at least three projects, including the practice project, each project being completed in two-and-a-half or three weeks. The projects, although they should be different from one another, should require similar construction and upholstery techniques; for example, a footstool project can be followed by a miniature chair project, with the seat of the chair being essentially a repetition of the footstool.

Students with limited ability may require a good deal of individual instruction. Projects for such students should be designed for ease of execution and a certain amount of repetition. The precovering of each project can provide such repetition. Materials for projects should be easy to stretch and form.

Organizational skills and a sense of responsibility (indicated by prompt and regular attendance) are characteristics that most industries expect in employees. These can be treated as learning objectives in most project work.

Students should be able to work both independently (with a minimum of direction) and co-operatively in groups. If group projects are not possible in Grade 9, the clean-up procedures may be carried out in teams. This experience can nurture the ability of many students to work in groups regularly.

In Grade 10, teachers should encourage students to apply their skills by doing a variety of minor repairs to gym bags, jackets, belts, wallets, and other, similar items. Students should also be encouraged to use their expertise at home in the planning of decor and

the selection of fabrics for draperies and clothing. Such applications can serve to increase the students' understanding of basic

design principles and related technical vocabulary.

General Level

Course codes assigned to general level courses planned under this section will be TXU1G for Grade 9 and TXU2G for Grade 10.

Aims

In all courses based on this section, students will have the opportunity to:

- develop safe work habits and practices;
- learn to use hand and power tools safely and effectively to measure, cut, sew, shape, and fasten upholstering materials;
- acquire knowledge about upholstery coverings, modern furniture styles, and trends in furnishing;
- develop skill in using common upholstery supplies to insulate, cover, secure, close, and decorate upholstered articles;
- develop the ability to plan and perform tasks efficiently, using a logical sequence of operations;
- develop a positive attitude towards good work habits, the ability to critically evaluate the results of their own work, and a sense of satisfaction in doing a good job;
- exercise intellectual curiosity and imagination, which are needed for learning, decision making, and problem solving;
- develop an attitude of respect and co-operation towards fellow workers and supervisors;
- develop a vocational or avocational interest in upholstery;
- acquire information about careers and further training opportunities in upholstery and a perspective on the place of this industry within the textile field.

Suggestions for Teachers

General level courses in upholstery based on this section should provide students with exploratory experiences that can test their interest in and aptitude for occupations related to upholstery as well as prepare them for further education in a college of applied arts and technology or other non-university educational institution. Courses planned for the general level should reflect a higher ratio of theoretical to applied activity than courses planned for the basic level. Whenever possible, assignments and projects should require problem solving, design, and independent research.

In Grade 10, a project involving the complete rebuilding of a chair can give students the chance to study topics from "Course Content for the Textiles Grouping" (page 30) that are of particular interest to them. Students interested in self-employment, for instance, may wish to explore additional content from

unit 31, "Management". Others may wish to investigate topics in unit 29 ("Applied science") that are related to fabrics or springs. Still others may wish to explore design topics included in units 27 and 49.

Suggestions outlined in the preceding section for basic level courses may be adapted to general level courses planned under this section. Suggestions and comments applicable to bi-level classes combining general and basic level students are provided on page 2 of this document.

The introduction to the history of furniture (unit 30) should be related wherever possible to the students' academic courses. Historical changes in furniture styles and the reasons for such changes may also be explored in this way.

Upholstery

Senior Division

(Grades 11 and 12)

Students taking Senior Division courses in upholstery will be involved in a range of projects designed to prepare them for work in custom upholstery, upholstering in factories, and/or postsecondary studies related to the upholstery field. As well, the courses can help students to become familiar with occupational areas related to the upholstery and textile industries, thereby increasing their ability to find work in such areas.

Students with ambitions of owning their own businesses will find that the reupholstering trade need not be capital intensive. The possibilities for fulfilling such self-employment ambitions will be explored as part of these courses.

Courses in upholstery are authorized for Grades 11 and 12 at basic and general levels

of difficulty. Chart 10.1.6 identifies the core content for these levels. The aims and suggestions for designing courses at these levels are provided in the sections that follow the chart.

The amount of in-school time allotted for Senior Division courses in this subject may vary, depending on local requirements, from a minimum of approximately 55 hours over a two-year period to a maximum of 440 hours per year. If only the minimum time is available, then some of the core content will necessarily be given superficial treatment. It is suggested that fuller treatment be given to those core items related to safety, hand and power tools, sewing equipment, fabrics, padding and cushioning, measuring and estimating materials, and layout and cutting of materials.

Chart 10.1.6
Core Content for
Upholstery
Senior Division
(Grades 11 and 12)

Content Units	Core Content for Courses	
	Basic	General
1. Safety	a	a
2. Hand and power tools	a	a
3. Sewing equipment	a	ab
4. Fabrics	ab	ab
5. Padding and cushioning	ab	ab
6. Measuring and estimating materials	ab	abc
7. Layout and cutting of materials	ab	ab
8. Upholstered furniture seats, backs, arms, and legs	ab	ab
9. Upholstered furniture frames	ab	abc
10. Patternmaking for upholstery	a	a
11. Cover application in upholstery	a	a
12. Trimming upholstery	a	a
13. Welting	a	a
14. Bands	a	a
15. Buttons	a	a
16. Cushions	b	b
17. Skirts	b	bc
18. Edge rolls and hard front edge in upholstery	abc	abc

Content Units	Core Content for Courses	
	<i>Basic</i>	<i>General</i>
19. Tufting	a	a
20. Channels	a	a
21. Webbing	a	a
22. Sagless springs and coil springs	ab	ab
23. Stripping a chair for reupholstering	a	a
24. Finishing show-wood in upholstery	ab	ab
25. Woodworking machines	ab	ab
26. Mechanisms in upholstered furniture	a	a
27. Planning decor	ab	ab
28. Access to trade information	a	a
29. Applied science	a	ab
30. History of the trade	a	a
31. Management	ab	ab
32. Sales techniques and marketing	a	ab
33. Job opportunities	a	a
34. Computers in industry		a
35. Supplies and materials		a
44. Minor repairs and alterations	c	
55. The textile industry	ab	bc

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Basic Level

Course codes assigned to basic level courses planned under this section will be TXU3B for Grade 11 and TXU4B for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- maintain a safe environment in the shop by storing and using supplies and equipment correctly and using protective clothing and devices;
- learn to use hand and power tools safely and effectively to measure, cut, sew, shape, and fasten upholstery materials;
- acquire knowledge of the nomenclature, and skill in the application, of upholstering techniques;
- acquire knowledge and aesthetic appreciation of design principles applied to upholstery, furniture construction, and interior design;
- develop techniques for thinking creatively when developing solutions to upholstery problems;

- increase their self-esteem by independently creating successful products;
- learn to work co-operatively on group projects;
- develop self-discipline relative to punctuality and preparedness (bringing necessary materials to class);
- acquire information about careers and further training opportunities related to upholstery and a perspective on the place of this industry within the textile field.

Suggestions for Teachers

Suggestions outlined for the section on basic level courses in the Intermediate Division should be reviewed by teachers planning courses for the Senior Division. Introductory experiences and projects in Grade 11 courses should review and build on skills and knowledge introduced in the Intermediate Division. Core topics that are covered in both divisions should be treated at greater depth and breadth each time they are structured into a project or other learning activity.

A variety of related themes may be included in Senior Division upholstery to accommodate optional topics. These themes include the following:

- canvas work - tents and tarpaulins;
- marine work - boat covers, convertible tops, and sails;
- cushions - adapting to continually changing styles in interior design;
- automobile trim - customizing and restoring vehicle interiors;
- specialty items - gun cases, snowmobile covers, and sports equipment.

Activities planned for the theme of automobile trim, for example, may quickly attract the keen interest of some students. A variety of modifications performed on seats, headers, and door panels, using rolls (channels), welting, and trapunto (an appliqué), provide unique touches in otherwise ordinary vehicles and serve to teach basic upholstery skills at the same time.

Student projects planned under themes such as those listed above can be selected to take advantage of available equipment and resources and/or to explore opportunities for self-employment in a specialized upholstering service. Such themes can be appropriately enhanced with additional topics drawn from

"Course Content for the Textiles Grouping" (beginning on page 30) or from other subject groupings.

In Senior Division, appropriate upholstering projects should never be in short supply. Students should be encouraged to bring project work for the course from home, relatives, and friends. Projects can also be undertaken as a community service for local organizations, the elderly, and other needy groups. Work on relevant projects of this type can often motivate students to achieve their best efforts.

Learning objectives developed for Senior Division courses should relate the aims to the planned course content and themes. To achieve these objectives, students need to be involved in group projects and individualized assignments. Students taking courses at the basic level of difficulty should be encouraged to work at their tasks independently. Such tasks include those they assume as contributing members in a group and those that represent stages of their work on an individual project. The development of this ability to work independently fosters students' self-confidence, improves performance, and increases students' potential for success in the workplace after graduation.

Where equipment, machines, materials, and information are available to students outside the shop, students should be encouraged, through assignments and projects, to take advantage of them. The exercise of appropriate safety precautions is an essential component of such activities.

The practice of good safety habits in the shop should cause students to develop safety-conscious attitudes that are permanent. Students should become aware of the need to follow safe practices in and out of school

and to apply sound accident-prevention methods in all of their activities.

At the basic level, approximately 70 per cent of the student's final mark should be based on the practical components of the course. At the beginning of any practical assignment or project, students should be made aware of the criteria that will be used for assessing achievement.

The development of career information is an ongoing component of all courses based on this guideline. Students may explore as a long-term assignment the variety of opportunities for employment and further training in upholstery. Many custom upholsterers operate their own shops, and some of them cater to a particular commercial client or group of clients. Industrial upholsterers may be found in companies that manufacture such products as furniture, mattresses, caskets, passenger vehicles, and aircraft. Industrial tradespeople often work on assembly lines and specialize in

some aspect of the trade, for example, patternmaking, spring installing, cutting, or sewing.

Work experience can benefit students at any stage of their Senior Division course work. Early work experiences may be used effectively to allow students to explore careers; later experiences can be used to reinforce and further develop course objectives. Co-operative education or part-time work in a job related to upholstery can improve students' chances for employment and career success in this field after graduation.

The average employer in the custom upholstery field seeks new employees who understand sales techniques, are able to communicate with customers, have a reasonable knowledge of upholstery and production methods, and are able to handle cash and follow sales control procedures. Many of these job-related skills can be structured into the learning activities of Senior Division courses.

General Level

Course codes assigned to general level courses planned under this section will be TXU3G for Grade 11 and TXU4G for Grade 12.

Aims

In all courses based on this section, students will have the opportunity to:

- acquire positive attitudes towards safety in the workplace by developing and applying safe work methods and procedures in the performance of tasks associated with the trade;
- learn to use hand and power tools safely and effectively to measure, cut, sew, shape, and fasten upholstery materials;
- understand and skilfully apply upholstery techniques;
- acquire knowledge and aesthetic appreciation of design principles related to upholstery, furniture construction, and interior design and become sensitive to changing trends in these design fields;
- develop techniques for thinking creatively when developing solutions to upholstery problems;
- develop the ability to work independently on individual projects and co-operatively on group projects;
- develop leadership skills through participation in group projects;
- gain insights about the relationship of technology to social, economic, and environmental aspects of our lives;
- become aware of the vocational implications of change in their physical and social environments and develop the ability to adapt to these changes intelligently;
- improve their ability to communicate and interact in the business world;
- acquire knowledge of careers and further training opportunities related to upholstery and a perspective on the place of this industry within the textile field.

Suggestions for Teachers

Courses in upholstery offered in the Senior Division at the general level of difficulty should provide students with opportunities to acquire basic skills and knowledge and to experience practical work activities that are fundamental to the trade. This learning should provide students with a comprehensive base from which to extend their studies in this subject field. Theoretical aspects of the core content will therefore be treated more intensively in general level courses than in basic level courses. Theoretical information may be garnered from independent study of enrichment material or from research associated with particular projects. In the latter case, the research problems may relate to design, operational, marketing, or other aspects of the project. Research on the manufacture of principal upholstery materials such as springs, foam rubber, and fabrics can be a common component of projects for general level courses in Grade 12.

Courses based on this section for general level courses need to be structured around projects that incorporate the practical activities, operations, and concepts included in the core learning (aims and subject content). Because projects are the means for translating the course objectives into practical learning activities, the projects for each course will differ, depending on the course objectives that have been planned.

The strategy of involving groups of students in projects of their own choice is an effective way of approaching some of the attitudinal

aims of the course. One type of group project involves the production of new pieces of upholstered furniture. New frames may be purchased or made by students. Such projects enable students to learn and apply all the techniques and methods of the upholstery trade. It is not generally possible to duplicate the specialized techniques of factory production. This limitation can impel students to innovate.

Suggestions outlined in the preceding section for basic level courses (Senior Division) and in the sections for both levels of upholstery courses in the Intermediate Division should be reviewed and adapted where appropriate to courses planned under this section for the general level. In particular, the comments related to themes, project activity, safety, evaluation of student achievement, work experience, and career opportunities should be noted.

Students enrolled in general level courses, particularly those interested in establishing their own upholstery businesses, may wish to conduct a survey of the training programs available in community colleges and other institutions. An awareness of the entry requirements and types of specialization available in such programs should influence the choice of related courses students make in secondary school.

Summary of Core Content for Courses in the Textiles Grouping

Chart 10.1.7

Content Units	Sewing and Clothing Construction				Textile Maintenance and Servicing				Upholstery			
	(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)	
	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General
1. Safety	efg	efg	efg	efg	b	bc	bcd	bcde	a	a	a	a
2. Hand and power tools									a	a	a	a
3. Sewing equipment	cd	cd	d	bd					a	a	a	ab
4. Fabrics	ceh	ceh	cehim	cehijm	c	cd	de	ef	a	a	ab	ab
5. Padding and cushioning									a	ab	ab	ab
6. Measuring and estimating materials									a	a	ab	abc
7. Layout and cutting of materials	ab	ab	abc	abc					a	a	ab	ab
8. Upholstered furniture seats, backs, arms, and legs									a	a	ab	ab
9. Upholstered furniture frames									a	a	ab	abc
10. Patternmaking for upholstery											a	a
11. Cover application in upholstery									a	a	a	a
12. Trimming upholstery									a	a	a	a
13. Welting									a	a	a	a
14. Bands									a	a	a	a
15. Buttons									a	a	a	a
16. Cushions										a	b	b
17. Skirts										a	b	bc
18. Edge rolls and hard front edge in upholstery									a	ab	abc	abc
19. Tufting											a	a
20. Channels											a	a
21. Webbing									a	a	a	a
22. Sagless springs and coil springs										a	ab	ab
23. Stripping a chair for reupholstering											a	a
24. Finishing show-wood in upholstery									a	a	ab	ab
25. Woodworking machines										a	ab	ab
26. Mechanisms in upholstered furniture											a	a
27. Planning decor									a	ab	ab	ab
28. Access to trade information											a	a
29. Applied science										a	a	ab
30. History of the trade			c		b	b	b			a	a	a
31. Management			cf	cef	d	e	f	fg	ac	ac	ab	ab

Content Units	Sewing and Clothing Construction				Textile Maintenance and Servicing				Upholstery			
	(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)		(Grades 9-10)		(Grades 11-12)	
	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General	Basic	General
32. Sales techniques and marketing		a	ab	abc			bc	bc			a	ab
33. Job opportunities	a	a	a	abc	b	b	bc	bc	a	a	a	a
34. Computers in industry				a								a
35. Supplies and materials			c	c				b				a
36. Plant layout					a	b	c	cd				
37. Dry-cleaning and laundry systems					a	ab	c	cd				
38. Stain and soil removal	a	a	a	a	a	ab	cd	ce				
39. Finishing (pressing)					a	ab	c	d				
40. Goods in process					a	b	c	d				
41. Commercial laundry												
42. Solvent purification and reclaiming												
43. Seasonal garment care												
44. Minor repairs and alterations		a	ab	abc			a				c	
45. Pressing equipment	a	a	ab	ab								
46. Sewing – hand and machine stitches	ab	ab	abcd	abcd								
47. Patterns	ac	abc	bce	bcdef								
48. Clothing construction techniques	a	ad	ab	bcd								
49. Design in clothing			a	ab								
50. Industrial machines			a	a								
51. Fitting of clothing		b	ab	abc								
52. Personal wardrobe		a	a	a								
53. Mass production – clothing construction		a	a	ab								
54. Crafts with textiles			a	a								
55. The textile industry		a	ab	bc	a	ab	bc		a	ab	bc	

See "Course Content for the Textiles Grouping", beginning on page 30, for description of the subunits a, b, c, etc.

Course Content for the Textiles Grouping

1. Safety

- a) Precautions with sharp needles and tempered wire; dust particles as health and fire hazards; safety procedures in using sewing machines, woodworking machines, and cutting tools; proper storage and use of hazardous liquids; proper ventilation; proper dress in the shop; use of eye shields; proper use of push sticks; careful use of compressed air; location and proper use of fire extinguishers, emergency stop buttons, and first aid kit;
- b) accident prevention in store and plant; introduction to safe machine operation; first aid; fire regulations;
- c) awareness of the hazards of toxic vapour; in-plant safety regulations;
- d) safe operation of manual and automatic machinery; control of solvents, liquids, and chemicals (safe handling and use); prevention of injuries in materials handling;
- e) precautions for safe operation of plant systems, utilities, and power sources; introduction to relevant sections of the Health and Safety Act and Regulations; safe disposal of plant wastes (Ministry of the Environment Regulation 309);
- f) fundamental safety practices in the textile shop; general and specific safety procedures concerning sewing machines, cutting tools, pressing equipment; fire regulations;
- g) safety practices in the shop – good house-keeping as an accident-prevention measure.

2. Hand and power tools

- a) Care and correct use of basic hand tools used in upholstery work; care and correct use of air staple guns and button machine.

3. Sewing equipment

- a) Threading, adjusting, and operating upholstery sewing machines; identifying and maintaining major parts of sewing machines;
- b) simple running repairs on sewing machines;
- c) ripper, pins, thimble, tracing wheel (and paper), chalk pencil and beeswax; measuring tools – tape measure, ruler, 15-cm sewing gauge, hem marker; sewing machines (domestic and/or industrial) – basic machine parts, threading, operating, adjusting stitch size;
- d) operating domestic and industrial sewing machines; parts of the equipment; maintenance.

4. Fabrics

- a) Upholstery fabric – construction, changing styles and trends, suitability of coverings for particular environments (e.g., vinyls for kitchen and office furniture); types of fibres; weaving processes; types of flaws in fabric;
- b) selecting fabric for upholstery – strength, cleanability, soil resistance, special applications;
- c) identifying fibres and fabrics commonly used in textile production; why certain fabrics are commonly used for certain garments;
- d) recognizing weave types, knitting, and felting;
- e) characteristics and manufacturing processes of fibres and fabrics used in wearing apparel and coverings;
- f) relationship between the manufacturing process of a textile and its application in garment construction; problem solving related to the maintenance and servicing of fabrics of varying constructions;
- g) production technology related to various textile products that require special maintenance and servicing; processing special fabrics with limited serviceability; recognizing and using interfacings and underlining; applying special surface agents such as dyes, sizings, fixing agents (no-iron), flame and water retardants, and deodorizers; identifying and caring for fur used as wearing apparel;
- h) preparing fabric – straightening the ends and the grainline; terms – *grain*, *selvage*, *bias*, *nap*, *pile*; cotton – origin and manufacturing process, cotton fabric finishes, popular cotton fabrics;
- i) linen – origin (flax), manufacturing process; silk – origin (cocoon), manufacturing process; wool – origin, fabric manufacturing process;
- j) characteristics, care, and construction of various textiles; handling of special fabrics; types and uses of interfacings, underlinings, and linings;
- k) synthetic textile materials – nylon, acrylic, acetate, polyester, triacetate, spandex, trade names; production processes; characteristics, applications;
- l) textile dyeing and surface agents;
- m) handling techniques and care of various types of fibres.

5. Padding and cushioning

- a) Using various upholstery procedures to create a comfortable padded seat – correct use of height, depth, insulation, and coverings; types of paddings; applying padding and stuffing; primary and secondary padding;
- b) foam cushioning – types, forms created from foam blocks, techniques.

6. Measuring and estimating materials

- a) Measuring material for upholstery – correct procedure, direction of length and width, types of measuring devices, proper recording of measurements;
- b) computing yardage – using layout method, allowance for matching;
- c) estimating multiple yardage mathematically.

7. Layout and cutting of materials

- a) Marking out fabric – straightening fabric, marking layout lines, using straightedge, using chalk for marking, marking on reverse side of fabric, making identifying marks on pieces when cut; cutting out fabric – using shears correctly, avoiding cuts beyond layout lines;
- b) matching patterned and striped fabrics;
- c) pattern layout – identifying the right side of the fabric; caution when marking materials with a nap; ensuring that the pattern is placed in the proper direction on the material; computerized pattern layout;
- d) straight-edge and round-edge electric industrial cutters; cutting multiple layers of fabric; operating an electric notcher for making darts, pockets, hemlines, and other details.

8. Upholstered furniture seats, backs, arms, and legs

- a) Seats – tight seats, styles of seat cushions, types of fillings; backs – styles; arms – styles; legs – types;
- b) semi-attached backs and cushions – cutting, sewing, filling, and installing.

9. Upholstered furniture frames

- a) Frames – structural parts of footstool, chair, love seat, and sofa frames; types of wood used to provide strength; types of wood used as show-wood; wood joints – types, gluing, clamping, fastening; frame assembly – gluing, clamping, fastening;
- b) restyling frames – applying knowledge of seating dimensions and angles; clamping techniques for round and half-round frames;
- c) types of wood and techniques used in framemaking; new chair frames – variations in upholstering techniques; use of plans in framemaking.

10. Patternmaking for upholstery

- a) Measurement techniques; making new patterns; limitations in the use of old covers as patterns.

11. Cover application in upholstery

- a) Relationship between weaving process and material characteristics; using centre-to-centre method to eliminate bias stretch and ensure even and straight application; stretching fabric to desired tautness; making pleats; cambric lining – function and application as a dust collector on underside of furniture; use of muslin for precovering; cutting and fitting – where and how to cut, cutting fabric around the structural parts of the frame; tacking and stapling – functions and uses of various types and sizes of tacks and staples, temporary tacking, application of decorative tacks, gimp tacks, antique nails.

12. Trimming upholstery

- a) Trim methods; blind stitching; blind tacking; lace tacking; tacking strips; gluing, gimp, and double welt.

13. Welting

- a) Measuring and making welts; use of contrast; applying to frame, joining.

14. Bands

- a) Measuring and making bands with and without welting; applying bands using back tacking technique; padding bands.

15. Buttons

- a) Button press and dies; arranging buttons on upholstery; using single-point straight needle; making upholsterer's knot.

16. Cushions	<ul style="list-style-type: none"> a) Making square cushions; types of fillings; filling cushions; using cushion machine and closing cushions by means of blind stitching; throw cushions – making with and without welting and/or buttons; b) making cushions with and without zippers; types of fillers; using cushion area and dividing this area for a balanced appearance; styles and designs of cushions.
17. Skirts	<ul style="list-style-type: none"> a) Making a plain flounce; b) methods of making plain and box pleat flounces; lining a flounce; pressing a flounce; computing amount of fabric for a box pleat flounce; methods of attaching flounces; c) planning pleats mathematically.
18. Edge rolls and hard front edge in upholstery	<ul style="list-style-type: none"> a) Edge roll – purposes, types, material, and construction; method of attaching each type; preformed edge rolls; b) making a hard front edge; c) stitched edge roll – making a stitched edge roll, varying heights of roll, selecting materials for roll construction; preformed edge rolls – attaching to spring edges, attaching to wood base.
19. Tufting	<ul style="list-style-type: none"> a) Computing button formation mathematically; method of hand tufting; production method of tufting.
20. Channels	<ul style="list-style-type: none"> a) Computing channel layout mathematically; types of fillers; sewing a channel cover; filling channel covers; installing channel backs.
21. Webbing	<ul style="list-style-type: none"> a) Types of webbing; correct methods of application; weaving the webbing as a base for coil springs or a pad seat.
22. Sagless springs and coil springs	<ul style="list-style-type: none"> a) Sagless springs – determining the length of sagless springs to produce a required crown; methods of attaching or hanging clips; producing a soft front edge; spring gauges for seats and backs; coil springs – sewing to webbing, clipping to webbing, attaching to a wooden base, tying; b) spring gauges – operation and function; methods of making spring edges on coil spring and sagless spring construction; function and safe use of wire cutter and bender.

23. Stripping a chair for reupholstering	a) Using ripping tools correctly; order of stripping steps; determining the extent of necessary rebuilding; observing how chair was originally upholstered; repairing and restyling.
24. Finishing show-wood in upholstery	a) Sanding – types, safe use of sandpaper to prepare wood for staining and varnishing; finishing materials – types, safe and proper application, care and cleaning of brushes used; technological changes in finishing materials; b) refinishing show-wood – removing old finish, sanding, shellacking, staining, varnishing.
25. Woodworking machines	a) Using band saw, table saw, radial arm saw safely and effectively; b) other woodworking machinery available in shop.
26. Mechanisms in upholstered furniture	a) Operation and installation of mechanisms in recliners, rockers, and bed chesterfields.
27. Planning decor	a) Colour arrangements, compatible combinations of colour, blending, contrasting; effects of colours on rooms; effects of striped fabric, busy fabric, plain fabrics; b) furniture styles – antique, modern, traditional, North American, European.
28. Access to trade information	a) Acquiring information from custom shops and production factories.
29. Applied science	a) Applications of science in the manufacture of synthetic materials; b) theory of resiliency and principles of work relative to coil springs; c) chemistry of detergents, soaps, bleaches, sours (acids to maintain neutrality of wash), and alkalis; water analysis (soft water); solvents – distillation and filtration; application of colour to fibres; examining fibres and fabrics microscopically.
30. History of the trade	a) Upholstery – upholstery through the ages; impact of the industrial revolution on the upholstery trade; b) adaptation of the dry-cleaning and laundry industries to social and technological change; historical development of the industry; c) <i>haute couture</i> – history of fashion integrating glamour and art; evolution of modern western dress.

31. Management

- a) Business management fundamentals – elementary cash and inventory control, public and customer relations;
- b) estimating on upholstery jobs; advising on fabric selection and decor; integrity in business – licences, stuffing regulations;
- c) computing job costs to allow for profit;
- d) recording daily department production;
- e) introduction to production records, maintenance schedules, and inventory of supplies;
- f) cash and inventory control; public relations and development of communication skills;
- g) business terms – *sales, accounts payable and receivable, insurance*; analysis of costs and expenditures (operating statement); introduction to labour relations;
- h) French equivalents of key trade terms; keeping records of customers' goods, addresses, and complaints; cost control procedures, plant operation, sales and promotion schemes; quality control; machinery maintenance schedules; relevant municipal regulations.

32. Sales techniques and marketing

- a) Qualities of personality and conduct required for success in selling;
- b) proper presentation of self to customer; imparting information to customer;
- c) sales promotion.

33. Job opportunities

- a) Job opportunities at the custom and factory levels; payment by piece and by the hour; role of trade unions; training courses offered at community colleges; direct entry into trade; self-employment opportunities;
- b) job requirements and career, employment, and training opportunities in dry-cleaning and laundry industries;
- c) apprenticeship and part-time employment in textile maintenance industry; related industry opportunities; trade associations.

34. Computers in industry

- a) Use of computers in upholstery practice;
- b) use of computers in textile maintenance to provide information on customers, production and costs, textile research; introduction to digital printout data on mechanical systems and their utilities (steam, liquids, temperature).

35. Supplies and materials

- a) The most frequently used supplies for insulation, resiliency, securing, closing, and decorative additions on upholstery jobs; modern styles, trends, and coverings in upholstery applications;
- b) roles of the jobber and wholesaler serving the textile maintenance field;
- c) maintaining an inventory of consumable supplies; purchasing supplies and materials through wholesalers.

36. Plant layout

- a) Departments in a dry-cleaning establishment and their function; department work flow;
- b) sequence of job operations by departments; organizing work flow to meet production schedules;
- c) principles of production and work flow; machinery utilities and power systems; production standards; packaging and shipping; routines in the maintenance of plant and machinery;
- d) planning department and plant layout to maximize production efficiency; preventive maintenance schedules.

37. Dry-cleaning and laundry systems

- a) Machinery names and functions; standard processing cycles (both systems); work classification of standard loads; introduction to production records (weight reports);
- b) classifying goods in process; using processing formulas;
- c) operation of machinery – cleaning and washing cycles, load preparation, classification, and processing; function of solvent systems using petroleum solvent (140 flash), chlorinated and fluorocarbon solvents; solvent purification systems and tests; water washing systems and control;
- d) machinery operation to meet production standards and schedules; processing special goods with limited serviceability (textiles and garments); applying special surface finishes; operation and control of solvents, filters, distillation water and steam systems; cleaning and washing formulas; problem solving related to dry-cleaning systems.

38. Stain and soil removal

- a) Identifying wet and dry stains and soil; prespotting techniques; steam spotting on wool;
- b) silk and wool spotting procedures; recognizing and using spotting chemicals;
- c) identifying and removing stains and soil; spotting chemicals, bleaches, agents;
- d) spotting techniques, wet cleaning procedures; special stain and soil spotting analysis;
- e) using spotting chemicals and special agents to solve problems (e.g., odours, smoke damage); spotting techniques and stain removal on all types of goods in process.

39. Finishing (pressing)

- a) Introduction to machine pressing of standard garments (wool), laundry flatwear (sheets, etc.), and wearing apparel;
- b) introduction to machine and hand finishing of standard garments and linens;
- c) machine and hand pressing of standard and specialized garments to their original shape, size, and finish; application of special finishes; textile construction and serviceability;
- d) machine and hand finishing to meet production schedules and standards of quality (piecework); finishing details; garment construction and textile serviceability;
- e) machine finishing of goods by steam pressing and hot head pressing.

40. Goods in process

- a) Identifying goods in process for dry-cleaning and laundry services (tagging and invoicing); recognizing serviceable and unserviceable textiles; introduction to quality control;
- b) identifying and classifying textiles – recognizing serviceable and unserviceable goods; marking systems; awareness of production schedules; invoicing (billing), pricing, quality control;
- c) identifying and classifying goods in process; garment serviceability; production schedules; quality control; invoicing and order identification;
- d) textile serviceability; labelling systems; quality control of processed goods and services; problem solving related to customers' needs.

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| 41. Commercial laundry | a) Definition and operation of commercial laundry systems; production principles; equipment operation and function; water systems (water softeners, heat reclaimers); waste water disposal; washing formulas, soaps, chemicals; effects of washing formulas on textiles (white and colour retention); materials handling; quality control. |
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| 42. Solvent purification and reclaiming | a) Atmospheric and vacuum distillation systems, cookers, reclaimers, deodorizers, solvent savers, filters, and pump systems; solvent temperature control; solvent testing; charge systems; proper detergent use relative to redeposited soil and foreign matter accumulation in solvent systems. |
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| 43. Seasonal garment care | a) Identifying, classifying, cleaning, and storing fur, fur-trimmed, and leather garments; storage vault construction and operation; record keeping; insect control; management; municipal regulations; insurance. |
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| 44. Minor repairs and alterations | a) Hand and machine skills in adjusting and altering wearing apparel (replacing buttons, fasteners, linings, cuffs, and pockets), altering length of skirts and pants;
b) altering and adjusting wearing apparel and fabrics to meet specific demands for size, shape, and finish;
c) adjusting and altering textile coverings, specialty items. |
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| 45. Pressing equipment | a) Operating domestic and industrial pressing irons; pressing equipment – ironing boards, tailor's ham, sleeve roll, needleboard; use of pressing in the sewing process;
b) operating a steam press, apparel press, spot cleaner. |
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46. Sewing – hand and machine stitches

- a) Hand sewing – basting, cross back stitching, overcasting, hemming stitches; sewing on buttons, dome fasteners, hooks and eyes; machine sewing straight lines on fabric (using the presser foot as a guide for a 6-mm seam allowance); sewing and clipping or trimming inner and outer square corners and inner and outer curved seams with appropriate seam allowances;
- b) sewing samples to demonstrate terms – *basting, dart, stay-stitching, understitching, grading, facing, and interfacing*; seam finishes – pinked, zigzagged, overcast by hand, turned and edge stitched, bound;
- c) special seams – French, flat-felled, piped, corded; embroidery – stitches, application;
- d) creative stitching on modern domestic machines.

47. Patterns

- a) Information on pattern envelopes; proper use of pattern symbols; techniques for transferring pattern marks to fabric; layout;
- b) selecting pattern size and style; coordinating pattern to figure type with fabric; using patterns and instruction sheet;
- c) basic adjustments on a commercial pattern – lengthening, shortening, width adjustments, dart manipulation;
- d) drafting a basic pattern for a garment;
- e) taking a person's measurements and using them to make calculations for pattern adjustments and material costs; producing an individualized pattern for a blouse, shirt, pair of slacks, or skirt;
- f) the importance and significance of accurately drafting a block pattern for grading; grading a pattern to increase or decrease sizes to suit an individual.

48. Clothing construction techniques

- a) Applications of various seams and seam finishes; making hems, waistbands, fly fronts for slacks or pants; inserting a zipper; making a simple garment from a pattern; making measurements;
- b) making a bound placket for a shirt sleeve, sleeves, pockets (set-in and patch), collars, trims, darts, facings, closures, machine and bound buttonholes; making a garment with sleeves and collar from a pattern; knit fabrics – techniques for sewing and making a garment; estimating and costing;
- c) making a tailored or dressmaker suit;
- d) finishing techniques involved in industrial sewing.

49. Design in clothing

- a) Styles of clothes to suit various body shapes and sizes; choosing clothes to emphasize particular features; choosing colours and patterns in clothing for best personal effect;
- b) structural and decorative design in clothing; applying basic elements of design (line, colour, texture, harmony, proportion, balance, rhythm) to clothing;
- c) historical costume; famous clothing designers;
- d) an overview of the fashion design industry;
- e) pattern drafting to implement clothing design; pattern drafting to modify an existing design.

50. Industrial machines

- a) Operating industrial production machines – serging, basting, blindstitching, buttonholing, tacking; various types of sergers.

51. Fitting of clothing

- a) Taking body measurements correctly; relating body measurements to pattern measurements and altering pattern pieces as necessary;
- b) fitting a garment to the individual figure during construction; adjusting seams, darts, ease;
- c) compensating for figure peculiarities in the construction of clothing.

52. Personal wardrobe

- a) Short- and long-term care of personal clothing; planning a personal wardrobe.

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| 53. Mass production – clothing construction | <ul style="list-style-type: none">a) Methods used by manufacturers to cut and sew garments and textile articles of one design in quantity;b) overview of clothing production industry – trends, opportunities. |
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| 54. Crafts with textiles | <ul style="list-style-type: none">a) Making soft toys; quilting small items such as placemats and bags; fabric collage; machine decoration techniques;b) draperies, quilting, men's wear, lingerie and swimwear, doll clothes, infants' and children's wear, home accessories (pillows, slipcovers), canvas products;c) weaving, knitting, crocheting, embroidery, macramé, rug hooking, fabric printing and dyeing (tie-dye and batik), braided rugs, fabric pictures, needlepoint, appliqué, leather crafts. |
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| 55. The textile industry | <ul style="list-style-type: none">a) Overview of the textile industry – major occupational areas; in-depth study of one of the occupational areas;b) textile manufacturing and the sources of fibres;c) regulations governing working conditions in one of the occupational areas; associations involved with the occupational area. |
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Appendix

Courses in Technological Studies (by Subject Grouping)

*Courses identified with this symbol will continue for the time being to be based in part on existing Senior Division guidelines, such as the *Elements of Technology* series and particular Grade 11 and 12 outlines in *Technical Subjects RP-27, 1963*.

	Course	Div	Approved Course Levels			Course Code
1. Transportation Grouping	Automotive Mechanics	Int	Basic	General	Advanced	TAM
	Automotive Mechanics*	Sr	Basic	General	Advanced	TAM
	Auto Body Repair	Int	Basic	General		TAB
	Auto Body Repair*	Sr	Basic	General		TAB
	Small Engines	Int	Basic	General		TAE
	Small Engines*	Sr	Basic	General		TAE
	Service Station Attendant	Int	Basic			TAS
	Service Station Attendant	Sr	Basic			TAS
	Agricultural Equipment Servicing	Int	Basic	General		TAG
	Agricultural Equipment Servicing	Sr	Basic	General		TAG
2. Construction Grouping	Woodwork	Int	Basic	General	Advanced	TCW
	Construction Technology*	Sr	Basic	General	Advanced	TCY
	Carpentry*	Sr	Basic	General		TCC
	Industrial Woodwork*	Sr	Basic	General		TML
	Masonry and Trowel Trades	Int	Basic	General		TCT
	Masonry and Trowel Trades	Sr	Basic	General		TCT
	Heating, Refrigeration, and Air Conditioning	Int	Basic	General	Advanced	TCH
	Heating, Refrigeration, and Air Conditioning*	Sr	Basic	General	Advanced	TCH
	Plumbing and Pipefitting	Int	Basic	General		TCP
	Plumbing and Pipefitting*	Sr	Basic	General		TCP
	Building and Equipment Maintenance	Int	Basic	General		TCM
	Building and Equipment Maintenance	Sr	Basic	General		TCM
	Custodial Services	Int	Basic			TCS
	Custodial Services	Sr	Basic			TCS
	Painting and Decorating	Int	Basic	General		TCD
	Painting and Decorating	Sr	Basic	General		TCD

	Course	Div	Approved Course Levels			Course Code
			Basic	General	Advanced	
3. Electrical Grouping	Applied Electricity	Int	Basic	General	Advanced	TEA
	Electrical Technology*	Sr	Basic	General	Advanced	TEY
	Electronics	Int		General	Advanced	TEL
	Electronics*	Sr		General	Advanced	TEL
	Electrical Appliance Repair	Int	Basic	General		TER
4. Food Services Grouping	Electrical Appliance Repair	Sr	Basic	General		TER
	Computer Technology*	Sr		General	Advanced	TEC
	Baking	Int	Basic	General		TFB
	Baking	Sr	Basic	General		TFB
	Food Preparation – Commercial	Int	Basic	General		TFC
5. Graphics Grouping	Food Preparation – Commercial	Sr	Basic	General		TFC
	Food Preparation – Domestic	Int	Basic	General		TFD
	Food Preparation – Domestic	Sr	Basic	General		TFD
	Restaurant Services	Int	Basic	General		TFR
	Restaurant Services	Sr	Basic	General		TFR
5. Graphics Grouping	Drafting	Int	Basic	General	Advanced	TDR
	Drafting – Architectural*	Sr		General	Advanced	TDA
	Drafting – Electrical*	Sr		General	Advanced	TDE
	Drafting – Mechanical*	Sr		General	Advanced	TDM
	Drafting – Comprehensive*	Sr	Basic	General	Advanced	TDG
5. Graphics Grouping	Blueprint Reading and Sketching	Int	Basic	General	Advanced	TDB
	Blueprint Reading and Sketching	Sr	Basic	General	Advanced	TDB
	Graphic Communications	Int	Basic	General	Advanced	TGR
	Graphic Communications*	Sr	Basic	General	Advanced	TGR
	Photography	Int	Basic	General	Advanced	TGP
5. Graphics Grouping	Photography	Sr	Basic	General	Advanced	TGP
	Vocational Art*	Int	Basic	General	Advanced	TGV
	Vocational Art*	Sr	Basic	General	Advanced	TGV

	Course	Div	Approved Course Levels			Course Code
6. Horticulture Grouping	General Horticulture	Int	Basic	General	Advanced	THO
	General Horticulture	Sr	Basic	General	Advanced	THO
	Landscape Design and Maintenance	Int	Basic	General		THL
	Landscape Design and Maintenance	Sr	Basic	General		THL
	Nursery Production	Int	Basic	General		THN
	Nursery Production	Sr	Basic	General		THN
	Greenhouse Production	Int	Basic	General		THG
	Greenhouse Production	Sr	Basic	General		THG
	Floral Design	Int	Basic	General		THD
	Floral Design	Sr	Basic	General		THD
7. Materials, Processes, and Design Grouping	Industrial Arts, Grades 7 and 8	Int	—	—	—	—
	Industrial Arts, Grades 9 and 10	Int	Basic	General	Advanced	TIN
	Industrial Arts	Sr	Basic	General	Advanced	TIN
	Design Studies	Int	Basic	General	Advanced	TID
	Design Studies	Sr	Basic	General	Advanced	TID
	Elements of Technology*	Int	Basic	General	Advanced	TIE
8. Manufacturing Grouping	Elements of Technology*	Sr	Basic	General	Advanced	TIE
	Machine Shop Practice	Int	Basic	General	Advanced	TMS
	General Machinist*	Sr	Basic	General	Advanced	TMS
	Millwright*	Sr		General	Advanced	TMM
	Mechanical Technology*	Sr		General	Advanced	TMY
	Sheet Metal Practice	Int	Basic	General	Advanced	TMT
	Sheet Metal Practice*	Sr	Basic	General	Advanced	TMT
	Welding	Int	Basic	General		TMW
	Welding*	Sr	Basic	General		TMW
	Foundry Practice	Int	Basic	General		TMF
	Foundry Practice*	Sr	Basic	General		TMF
	Power Transmission and Control	Int		General	Advanced	TMC
	Industrial Control – Power and Processes*	Sr		General	Advanced	TMC
	Hydraulics and Pneumatics*	Sr		General	Advanced	TMH
	Instrumentation*	Sr		General	Advanced	TMI
	Principles of Technology*	Sr		General	Advanced	TMP

	Course	Div	Approved Course Levels		Course Code
9. Personal Services Grouping	Cosmetology	Int	Basic	General	TPC
	Cosmetology	Sr	Basic	General	TPC
	Guiding and Tourist Services	Int	Basic	General	TPG
	Guiding and Tourist Services	Sr	Basic	General	TPG
	Home Nursing, Child Care, and Health Care Services	Int	Basic	General	TPH
	Home Nursing, Child Care, and Health Care Services	Sr	Basic	General	TPH
10. Textiles Grouping	Sewing and Clothing Construction	Int	Basic	General	TXS
	Sewing and Clothing Construction	Sr	Basic	General	TXS
	Textile Maintenance and Servicing	Int	Basic	General	TXM
	Textile Maintenance and Servicing	Sr	Basic	General	TXM
	Upholstery	Int	Basic	General	TXU
	Upholstery	Sr	Basic	General	TXU

Module 1, 1986

Sewing and Clothing Construction (Grades 9-12)

Textile Maintenance and Servicing (Grades 9-12)

Upholstery (Grades 9-12)

